



VARIABLE SPEED DRIVE

Variable Speed Drive
Service Manual

Edition: February 2011

SD70MS01CI Rev. C

SAFETY SYMBOLS

Always follow safety instructions to prevent accidents and potential hazards from occurring.



WARNING

This symbol means inadequate operation and may result in serious personal injuries or death.



CAUTION

This symbol Identifies shock hazards under certain conditions. Particular attention should be given as dangerous voltage might be present. Maintenance operation should be done by qualified personnel



Identifies potential hazards under certain conditions. Read the message and follow the instructions carefully.



Identifies shock hazards under certain conditions. Particular attention should be given as dangerous voltage might be present.

Edition of February 2011

This edition could present technical imprecisions or misprints. The information here included will be periodically modified and updated, and all those modifications will be incorporated in later editions. In order to consult the most updated information of this product, you might access our website www.power-electronics.com, where the latest version of this manual can be downloaded.

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SAFETY INSTRUCTIONS

IMPORTANT!

- Read this manual carefully to maximize the performance of this product and to ensure its safe use.
- In this manual, safety messages are classified as follows:



WARNING

Do not remove the cover while power is applied or the unit is in operation.
Otherwise electric shock could occur.

Do not run the drive without the front cover. Otherwise you may get an electric shock due to the high voltage terminals or to the exposure of charged capacitors.

Do not remove the cover except for periodical inspections or wiring, even if the input power is not applied. Otherwise you may access the charged circuits and suffer an electric shock.

Wiring and periodic inspections should be performed at least 10 minutes after disconnecting the input power and after checking the DC Link voltage is discharged with a meter (below 30VDC). Otherwise you may suffer an electric shock.

Operate the switches with dry hands.
Otherwise you may suffer an electric shock.

Do not use cables with damaged insulation.
Otherwise you may suffer an electric shock.

Do not subject the cables to abrasions, excessive stress, heavy loads or pinching.
Otherwise, you may suffer an electric shock.



CAUTION

Install the drive on a non-flammable surface. Do not place flammable material nearby. Otherwise fire could occur.

Disconnect the input power if the drive gets damaged. Otherwise it could result in a secondary accident or fire.

After the input power is applied or removed, the drive will remain hot for a couple of minutes. Touching hot parts may result in skin burns.

Do not apply power to a damaged drive or to a drive with parts missing even if the installation is complete. Otherwise you may suffer an electric shock.

Do not allow lint, paper, wood chips, dust, metallic chips or other foreign matter into the drive. Otherwise fire or accident could occur.



WARNINGS

SAFETY

- Wear safety glasses when operating the drive with power applied and the front cover is removed.
 - Handle the drive with care according to its weight.
 - Install the drive according to the instructions included in this manual.
 - Do not place heavy objects on the drive.
 - Ensure that the mounting orientation is correct.
 - Do not drop the drive or subject it to impact.
 - The SD700 drives contain static sensitive printed circuits boards. Use static safety procedures when handling these boards.
-

CONNECTION PRECAUTIONS

- For EMERGENCY STOP, make sure supply circuitry is open.
 - Do not disconnect motor cables if input power supply remains connected. The internal circuits of the SD700 series will be damaged if the incoming power is connected and applied to output terminals (U, V, W).
 - Always check whether the DC Link LED is OFF before wiring terminals. The capacitors may hold high-voltage even after the input power is disconnected. Use caution to prevent the possibility of personal injury.
-

TRIAL RUN

- Verify all parameters before operating the drive. Alteration of parameters may be required depending on application and load.
 - Always apply voltage and current signals to each terminal that are within levels indicated within this manual. Otherwise, damage to the drive may result.
-

EARTH CONNECTION

- The drive is a high frequency switching device and leakage current may flow. Ground the drive to avoid electrical shock. Use caution to prevent the possibility of personal injury.
 - Connect only to the dedicated ground terminal of the drive. Do not use the case or the chassis screw for grounding.
 - When installing, grounding wire should be connected the first and removed the last.
 - Motor ground must be connected to the drive ground terminal and not to the installation's ground. We recommend that the section of the ground connection cable should be equal or higher than the active conductor.
 - Installation ground must be connected to the drive ground terminal.
-

1. INTRODUCTION

1.1. About this manual

This manual refers to the SD700 Variable Speed Drive. Specific models are shown in Table 1.

	380V	690V
FRAME 4	SD700905X	SD700526X
	SD701155X	SD700626X
	SD701505X	SD700806X
	SD701705X	SD701056X
FRAME 5	SD702105X	SD701306X
	SD702505X	SD701506X
	-	SD701706X
FRAME 6	SD703305X	SD702106X
	SD703705X	SD702606X
	SD704605X	SD703206X
FRAME 7	SD705805X	SD703856X
	SD706505X	SD704606X
	SD707205X	-
FRAME 8	SD708405X	SD705506X
	SD709255X	SD706606X
FRAME 9	SD7110305X	
	SD7111505X	
	SD7112605X	
	SD7114405X	
FRAME 10	SD7115805X	
	SD7118005X	
FRAME 11	SD722005X	

Note 1: All drives of frame 9 are obtained by assembling 3 models of frame 6.

Note 2: All drives of frame 10 are obtained by assembling 3 models of frame 7.

Note 3: All drives of frame 11 are obtained by assembling 3 models of frame 8.

	380V		690V	
FRAME 9	SD710305x	3 x SD703705x	SD707506x	3x SD702106X
	SD7111505x	3 x SD703705X	SD708406x	3x SD702106X
	SD7112605x	3 x SD704605X	SD709506x	3x SD702606X
	SD7114405x	3 x SD704605X		
FRAME 10	SD7115805x	3 x SD705805X	SD711406x	3x SD703856X
	SD7118005x	3 x SD706505X	SD712706x	3x SD704606X
			SD714206x	3x SD704606X
FRAME 11	SD722005x	3 x SD708405X	SD715006x	3x SD705506X
			SD718006x	3x SD706606X

This manual outlines all the procedures for a field testing, repair and re-powering of a faulty SDrive. It is not intended as a commissioning guide. Refer to the SD700 Getting Started Manual for commissioning information.

1.2. Who should undertake service

Servicing of an SD700 should be only undertaken by suitably qualified or experienced technicians. The service personnel should be qualified in the principles of power electronics.

1.3. Level of servicing

All the SD700 covered in this manual are built on a modular basis. These modules are designed to be disassembled and replaced as necessary to perform repair. A list of available spare parts and modules is in *Section 8* of this manual.

Printed circuit board assemblies are not designed to be serviced as components. They are usually complex and require special test equipment for servicing.

1.4. Notes

It is the integrator's responsibility to ensure the configuration and installation of the SD700 meets the requirements of any specific site, local and national electrical regulations.

It is the responsibility of the end user/purchaser to ensure that operators understand how to use this equipment safely. Please read this manual carefully.

2. BEFORE STARTING TESTING OR SERVICE WORK.

Site Preparation

The SD700 is best serviced on a bench, if it is possible. The working area in front of the SD700 must be clean and tidy, especially while servicing the biggest and heaviest SD700 sizes.

Flat surfaces for placing parts on and containers for small items like screws and bolts will be necessary.

Tools requirements

- No.2 Phillips screwdriver
- No.3 Phillips screwdriver
- 17 mm nut drivers
- 13 mm nut drivers
- 10 mm nut drivers
- Multimeter upto 1000V AC and DC maximum.
- Variac

Safety and Testing Before Starting Repairs

- 1) Isolate and lock out the mains supply to the SD700 and any low voltage supply that may be in parallel with the control power supply.
- 2) Allow approximately 5 minutes for the DC Bus capacitors to be discharged.
- 3) Test between input terminals L1, L2, L3 and L1, L2, L3 to earth to ensure the supply has been disconnected.
- 4) Test between the HVDC (+) and HVDC (-) Bus terminals to ensure the DC Bus has been fully discharged.

3. PRINTED CIRCUIT BOARD DESCRIPTIONS

3.1. Input Rectifier.

The three phases mains supply the rectifier circuit through terminals L1, L2, L3. Each input supplies through a high speed fuse and one winding on a three phase AC choke.

The input rectifier is a three phase half controlled bridge circuit, with three diode/SCR modules. Each SCR module has a Snubber PCB. This PCB restricts the current to avoid a damage in the circuits and smooths the commutations of each diode/SCR. This PCB has also incorporated a circuit to control the current, which charges the DC Bus.

The output of the rectifier supplies to the DC Bus. The DC Bus has a bank of capacitors. These capacitors are joined in series in parallel. For 400 V_{ac} input, the DC Bus output on no loads is approximately 565 V_{dc}. Wire-wound resistors are fixed across the capacitors in order to share voltage of the series capacitors.

3.2. Output Inverter Bridge.

The DC Bus supplies to the three phases of the inverter bridge, which is composed of 3 IGBTs (Insulated gate bipolar transistors). The IGBTs modulate the required three phases output waveform to supply to the motor through terminals U, V, W.

The Current Transformers (DCCT) and the Output Chokes are placed in the middle of the IGBTs and the output terminals U, V, W. The IGBTs are protected by two PCBs, the gate drive PCBs.

The upper gate drive controls the IGBTs logic pulses, and detects an IGBT desaturation. The lower Gate Drive contains the shot resistors and the protection varistors.

3.3. Power PCB

This PCB contains the following circuits:

- Switch mode Power supply: generates all required DC voltages.
- SCR pulses generation: generates the SCR firing pulses for soft charge ramp.
- Protections: Protections for a high and low Bus voltage, shortcircuits and high temperature.
- Drive Select module: It is plugged to the power PCB, shows the rating identification, and scales the DCCT outputs for relaying to the control PCB.

3.4. Control PCB

This PCB generates the waveform; control input and output processing, mode selection and parameters setting. It also controls an alphanumeric display and keypad for user interface.

4. FAULT MESSAGES. DESCRIPTIONS AND ACTIONS

4.1. Introduction

When a fault occurs, the SD700 will stop the motor and show a fault in the display. You can display this fault in the programming line (lower line) while motor current and the speed values are displayed in the upper line at the moment of the fault.

It is possible to navigate through the additional display lines to access other status parameters without resetting the fault. These additional status parameters offer further information about the moment, when the fault occurred. Additionally, the FAULT led will blink and the fault message will be displayed until the fault is over and the drive is reset.



Figure 1.1 Fault displaying - Programming Line

4.2. Faults List

Fault: I LIM FLT

Description: Output current has reached a dangerous level. The value is above 220% of the drive rated current. Protection is activated instantaneously.

Possible cause: Motor output short circuit; Wiring fault; Circuit fault; Motor fault.

Actions: Check output cables and motor for possible wiring faults or short circuits.

Fault: F2 V LIM FLT

Description: DC Bus voltage has reached a dangerous level >850Vdc. Hardware Protection. Drive will cut off the output to the motor.

Possible cause: High voltage peak on the input; High load regeneration; Deceleration ramp too high

Actions: Check conditions of input power supply. Decrease deceleration ramps (parameters 'G5.2 DECEL1' and 'G5.4 DECEL2').

Fault: F3 PDINT FLT

Description: Bus voltage and the output current of the device have reached dangerous levels.

Possible cause: See faults F1 and F2.

Actions : See faults F1 and F2.

Fault: F4 U+ DESAT; F5 U- DESAT; F6 V+ DESAT; F7 V- DESAT; F8 W+ DESAT; F9 W- DESAT

Description: An Internal protection tripped within the IGBT semiconductors.

Possible cause: Short circuit; Extreme overcurrent, overload; Wiring fault; circuit fault; Desaturation of IGBT; IGBT fault.

Actions: Check if there are possible wiring faults or a motor fault. If the fault persists after disconnecting output wires, Check IGBTs (section 6.4)

Fault: F10 NEG DESAT

Description: An automatic internal protection of several of the IGBT semiconductors tripped.

Possible cause: Short circuit; Extreme overcurrent; device overload; Desaturation of IGBT; IGBT fault.

Actions: Check conditions of input power supply and wiring conditions. Check the Fuse 4 in the Power PCB (section 4.4.2)

Fault: F11 VIN LOSS

Description: Power supply loss of any input phase for a time higher than 20ms occurred.

Possible cause: Input power is incorrect, damaged fuses; Input wiring is incorrect;

Actions: Check conditions of input power supply; Check wiring; Check input Fuse (section 4.4.1)

Fault: F12 IMB V IN

Description: Power supply loss of any input phase for a time higher than 20ms has occurred.

Possible cause: Input power is incorrect, damaged fuses.

Actions: Check conditions of input power supply; Check wiring; Check input Fuse (section 5.4.1); Check Fuses of Snubber PCB (section 4.4.3)

Fault: F13 HI V IN

Description: Input voltage imbalance higher than $\pm 10\%$ of average input power supply of SD700 for a time higher than 100ms.

Possible cause: Input power is incorrect; Incorrect setting of parameter 'G11.6 HIGH VOLT'

Actions: Check input power conditions; Check parameters settings;

Fault: F14 LW V IN

Description: Average supply voltage is lower than the value set in 'G11.4 LOW VOLT' for a longer time than the one set in 'G11.5 LOW V TO'

Possible cause: Input power is incorrect, damaged fuses; Incorrect setting of parameter 'G11.4 LOW VOLT'.

Actions: Check input Fuse (section 4.4.1); Check Fuses of Snubber PCB (section 5.4.3); Check input power conditions; Check parameters settings.

Fault: F15 CURL Vdc

Description: Unstable bus voltage. There is a DC Bus voltage ripple higher than 100Vdc for more than 1.1 seconds.

Possible cause: Input power is incorrect; Motor is driving an unstable load;

Actions: Check input power conditions, load type of the application, and all the motor mechanical parts. If the fault persists after disconnecting output wires, check rectifiers (section 6.1) and check IGBTs (section 6.4)

Fault: F16 HI Vdc

Description: DC Bus voltage has exceeded critical operating level (>850Vdc). Software Protection.

Possible cause: High voltage peak at the input; High load regeneration; Deceleration ramp too high

Actions: Check conditions of input power supply; Check stop conditions of the drive; Decrease deceleration ramps (parameters 'G5.2 DECEL1' and 'G5.4 DECEL2').

Fault: F17 LW Vdc

Description: DC Bus voltage is lower than the critical operating level (<350Vdc).

Possible cause: Input power is wrong, damaged fuses.

Actions: Check conditions of input power supply; Check input Fuse (section 4.4.1); If the fault happens when the device is loaded, check that the DC Bus voltage doesn't fall down. If the voltage falls down might be due to a fault in the rectifiers (section 6.1)

Fault: F18 IMB V OUT

Description: Voltage imbalance higher than $\pm 5\%$ of the average drive output voltage for a time longer than 100ms.

Possible cause: Motor is driving an unstable load; Motor wiring fault; Motor is wrong

Actions: Check motor circuit completely in case of possible wiring faults or motor fault. If the fault persists after disconnecting output wires, change Power PCB

Fault: F19 IMB I OUT

Description: Current imbalance of more than $\pm 25\%$ of the average output motor current for a time longer than 1s.

Possible cause: Motor is supporting unstable loads; Motor wiring fault; Motor is wrong.

Actions: Check motor circuit completely in case of possible wiring faults or motor fault.

Compare the current at the output with the current shown in the display. If the current is different, change the Power PCB.

Fault: F20 GROUND FLT

Description: Current level to the ground has exceeded the level set in 'G11.3 GND I LIMIT'.

Possible cause: Motor or wiring has short-circuited to ground; Ground is incorrectly connected or wrong.

Actions: Disconnect the motor and wiring of the SD700 and check motor insulation; Check and improve the ground connection system.

Fault: F21 I LIM T/O

Description: Motor current has exceeded the current limit set in 'G10.5 I LIMIT' for the time set in 'G10.6 I LIM TO'.

Possible cause: Motor stalled. Heavy load; Motor mechanical brake is coupled.

Actions: Check the motor load; Increase maximum current limit.

Fault: F22 TQ LIM T/O

Description: Motor torque has exceeded the torque limit set in parameter 'G10.7 MAX TOR' for the time set in 'G10.8 T LIMT TO'.

Possible cause: Motor stalled. Heavy load; Motor mechanical brake is coupled.

Actions: Check the motor load; Increase maximum current limit.

Fault: F25 MTR O/L

Description: Motor overload calculated by SD700 thermal model has exceeded 110%.

Possible cause: High current injected to the motor due to heavy load; The load exceeds the capacity of motor cooling under normal operating conditions; Incorrect setting of the thermal model parameters; Phase loss of the motor or a fault in motor windings.

Actions: Check the motor load.

Check the setting of parameters 'G2.1 MTR CUR' and 'G2.7 MTR COOL' related to the motor thermal model. Increasing the parameter 'G2.7 MTR COOL', can be undertaken when there is a motor PTC fitted and it is connected to the SD700.

Fault: F27 DL SMTH

Description: DC Bus has not been charged in the expected time

Possible cause: Potential damage to the soft charge resistors of the SD700.

Actions: Try to reset the fault. Disconnect and re-connect again the input power. If the fault persists check rectifiers (section 6.1)

Fault: F28 MICRO FLT

Description: Microprocessor has detected wrong data.

Possible cause: Input power fault; Parameters setting is not recognised.

Actions: Disconnect and re-connect the SD700 input power of the drive. If the same fault appears, initialize all of the parameters (parameter 'G1.5 INITIALISE') and connect the input power again. If the fault persists, change Control PCB

Fault: F29 DSP FLT

Description: DSP has detected wrong data.

Possible cause: Input power fault; Parameters setting is not recognised

Actions: Disconnect and connect again SD700 input power. If the same fault appears, initialize all the parameters (parameter 'G1.5 INITIALISE') and connect the input power again. If the fault persists, change Control PCB

Fault: F30 WATCHDOG

Description: An unknown fault has reseted the microprocessor of the control board.

Possible cause: Input power fault.

Actions: Reset the fault; If the fault persists, change Control PCB

Fault: F31 SCR L1; F32 SCR L2; F33 SCR L3

Description: Trip on conduction status of thyristor 1, 2 or 3. The thyristor has not turned on correctly

Possible cause: A conduction fault occurred in the corresponding thyristor. The thyristor is OFF when it should be on.

Actions: Try to reset the fault. Disconnect and re-connect the input power. If the fault persists check Fuses of Snubber PCB (section 4.4.3)

Fault: F35 PHSE L1 LOSS; F36 PHSE L2 LOSS; F37 PHSE L3 LOSS

Description: Input phase L1, L2 or L3 is not present. Phase fault.

Possible cause: Input phase L1, L2 or L3 is not connected correctly or there is no voltage on it.

Actions: Verify the wiring of the input power supply of the drive. Check input voltage and input fuses. If the fault persists

Fault: F40 EXT / PTC

Description: External trip or motor PTC device has operated (terminals 8 and 9). Values out of the range might (85Ω to 2KΩ) generate this fault.

Possible cause: External trip device has operated; Motor is overheated (motor load exceeds the cooling capacity at operating speed); Fault in sensor connection.

Actions: Check the external trip switch (if exists); Check motor temperature. To reset the fault the motor must be return to normal temperature; Check sensor wiring. Check input Fuse (section 4.4.1)

Fault: F41 COMMS TRIP

Description: Trip generated through RS232 or RS485 communication. Master (PLC or PC) is generating a fault in the SD700 through serial communication.

Possible cause: Trip generated by a computer through serial communication.

Actions: Disconnect the SD700 from the communication network and verify if the fault is generated again. If the fault persists, change Control PCB.

Fault: F42 AIN1 LOSS

Description: The SD700 is not receiving any signal in the analogue input 1 and 'G4.2.14 AIN1 LOSS' is set 'Yes'. The signal connected to this input has been lost.

Possible cause: Analogue input cable has come loose or disconnected (terminals 10 and 11).

Actions: Verify the wiring and the device, which provides the analogue signal. If the fault persists, change Control PCB.

Fault: F43 AIN2 LOSS

Description: The SD700 is not receiving any signal in the analogue input 2 and 'G4.2.14 AIN1 LOSS' is set 'Yes'. The signal connected to this input has been lost.

Possible cause: Analogue input cable has come loose or disconnected (T12 and T13).

Actions: Verify the wiring and the device, which provides the analogue signal. If the fault persists, change Control PCB.

Fault: F44 CAL FLT

Description: Internal reference voltage levels are wrong.

Possible cause: SD700 fault.

Actions: Verify drive select. Replace the drive select

Fault: F45 STOP T/O

Description: Trip generated due to excessive stopping time. The elapsed time from stop signal activation has exceeded the value set in parameter 'G11.2 STOP TO'.

Possible cause: Deceleration ramps (parameters 'G5.2 DECEL1' and 'G5.4 DECEL2') are too slow; SD700 is limiting voltage due to the regeneration of the motor.

Actions: Verify that the time set in parameter 'G11.2 STOP TO' to stop the system after setting deceleration ramps and checking the system performance.

Fault: F46 EEPROM FLT

Description: Trip generated due to excessive stopping time. The elapsed time from stop signal activation has exceeded the value set in parameter 'G11.2 STOP TO'.

Possible cause: Integrated circuit fault.

Actions: Change the Control PCB

Fault: F47 COMMS T/O

Description: Trip generated due to excessive delay of serial communication. The elapsed time from the last valid data transmission has exceeded the time set in parameter 'G20.2 COMMS T/O'.

Possible cause: Communications cable has come loose or cut; Master device has not sent valid data in the required frame or it has sent incorrect data.

Actions: Verify the wiring of communications system; verify the data and settings of the master device. If the fault persists, change the Control PCB

Fault: F48 SPI COM

Description: Trip due to a wrong data bus transfer.

Possible cause: Input power fault.

Actions: Reset the device and if the fault persists, change the Control PCB

Fault: F49 SPD LIMIT

Description: Motor speed has exceeded the speed limit (parameters G10.1 to G10.4) for the time set in 'G11.1 SP LIM TO'.

Possible cause: Speed reference is higher than the speed limit; Motor speed is out of control or motor is accelerating because of the load.

Actions: Verify speed limits.

Fault: F50 PSU FAULT

Description: Internal power supply is not supplying the correct voltage. The voltage level has dropped to zero value for 100ms approx.

Possible cause: Damaged power supply.

Actions: Reset the device and if the fault persists ask for technical assistance.

Fault: F51 SCR TEMP

Description: Rectifier heat sink temperature has reached a dangerous level.

Possible cause: Temperature limits for SD700 rectifier has been exceeded.

Actions: Verify that the ambient conditions are the proper ones for the device.

Be sure that there is nothing obstructing the cooling fans (dust, papers, dirt, etc) and that these rotate correctly. In frame 6, 7 and 8, check that the current is the same in each rectifier.

Fault: F52 SOFT C TEMP

Descriptiption: A fault in the Fan power supply unit occurred.

Possible cause: The fans of the device are operating wrongly; The Fan power supply unit is overheated.

Actions: Verify that fans are not obstructed. Check that fans are not dirty and rotate correctly; Wait for the temperature of the power supply to go down to a normal value and restart it. You can disconnect the device, connect it again, and restart the power supply again. If the fault persists check the fan power supply fuses.

Fault: F53 INTRNAL TEMP

Descriptiption: Internal temperature of the SD700 control electronics chamber has reached a dangerous level.

Possible cause: The limit of internal temperature of the electronics chamber has been exceeded.

Actions: Verify that the ambient conditions are proper for the equipment.

Be sure that there is nothing obstructing the cooling fans (dust, papers, dirt in general) and that these rotate correctly. If the fault persists change fans.

Fault: F54 WATCHDOG TMR

Descriptiption: Internal fault of the microcontroller.

Possible cause: A fault in the microcontroller occurred.

Actions: Disconnect and re-connect the input power of the drive. If the fault persists, change Control PCB.

Fault: F56 EMERGEN.STOP

Descriptiption: Digital input configured as 'EXTERN MERGE' has been activated (NC contact).

Possible cause: An external trip occurred by closing a contact in the digital input configured in this option.

Actions: Verify the wiring of digital input. Check the installation.

Fault: F65 LOW PRESSURE

Descriptiption: Active only when operating in Pump Control mode. Trip generated when the pressure level is lower than the minimum pressure level set in 'G25.6.7 LoPre'.

Possible cause: Pressure reference is lower than the minimum pressure level (Active in Pump Control mode only).

Actions: Verify the setting of minimum pressure level; Check the operation of the low pressure switch detector; Check the status of the analogue inputs 1 and 2 in parameters SV3.1 and SV3.4 in displaying group G0.

Fault: F66 HI PRESSURE

Descriptiption: Active only when operating in Pump Control mode. External trip occurred when a digital input is configured in this option (Hi Pressure Switch) is closed.

Possible cause: An external trip occurred by closing a contact in the digital input configured in this option (Active in Pump Control mode only).

Actions: Check if the pressure of the installation exceeds the set limits; Verify the wiring of digital input.

Fault: F67 LOW WATER

Description: An external trip occurred when the Pump Program (G25) is activated and one of the digital inputs has been set as '59 LO WATER FLT'. Under these conditions, if a contact is opened in such digital input, the drive trips indicating that the pump is working with no load.

Possible cause: An external trip occurred by opening a contact in the digital input. (Active in Pump Control mode only)

Actions: A contact has been activated to indicate that there is a fault due to lack of water. Verify the conditions of the installation. Verify the wiring of digital input.

Fault: F68 CAVIT/UNDERL

Description: When the motor current is lower than the cavitation current and the motor speed is higher or equal than the cavitation speed during the time set for that purpose, the drive will trip. This avoids that the pump operates with no water (detection is done due to underload).

Possible cause: Settings of the drive in protections group G25.6 are incorrect.

Actions: Check if the pump of the installation is operating without water. Verify the settings of the parameters referred to the cavitation protection depending on the installation

Fault: F69 FLOW SWITCH

Description: The digital input configured as flow detection indicates flow absence according to the parameters set. See the protections set in G25.6 to obtain more detailed information.

Possible cause: The pump is operating with no load; Setting protections in group G25.6 are wrong.

Actions: Check if the pump of the installation is operating without water; verify the settings of the parameters referred to the cavitation protection depending on the installation.

Fault: F70 IRRIGATOR F

Description: The digital input configured as '62 IRRIGAT TRIP' detects that an external fault in the drive occurred.

Possible cause: An external trip occurred due to the closure of a contact in the digital input configured as IRRIGAT TRIP.

Actions: Verify your irrigating equipment and check if the connections between the drive and the irrigating equipment are correct.

Fault: F71 CYCLING

Description: Conditions set in group G25.6 are not met compared to the cycle time of the drive and the cycle counter. The SD700 has started a higher number of times than the allowed number without softening the time set.

Possible cause: The drive shows several start / stop cycles (wake up / sleep) in a short time.

Actions: Verify possible leakages in the installation; verify the settings of this protection in group G25.6.

Fault: F72 IN PRES SW

Description: This fault occurs mainly due to two causes:

1. After starting the system, the time set in G25.9.11 has been exceeded without the digital input configured as PRESSUR SWITC being activated.
2. After the priming pump has stopped and the drive pump has started, the digital input configured as PRESSUR SWITC is opened during the time set in G25.9.10.

Possible cause: Breakage or low water in aspiration circuit.

Actions: Verify the water level in the aspiration circuit (well, tank, etc.); Verify the status of the pressure switch.

4.3. Display fault

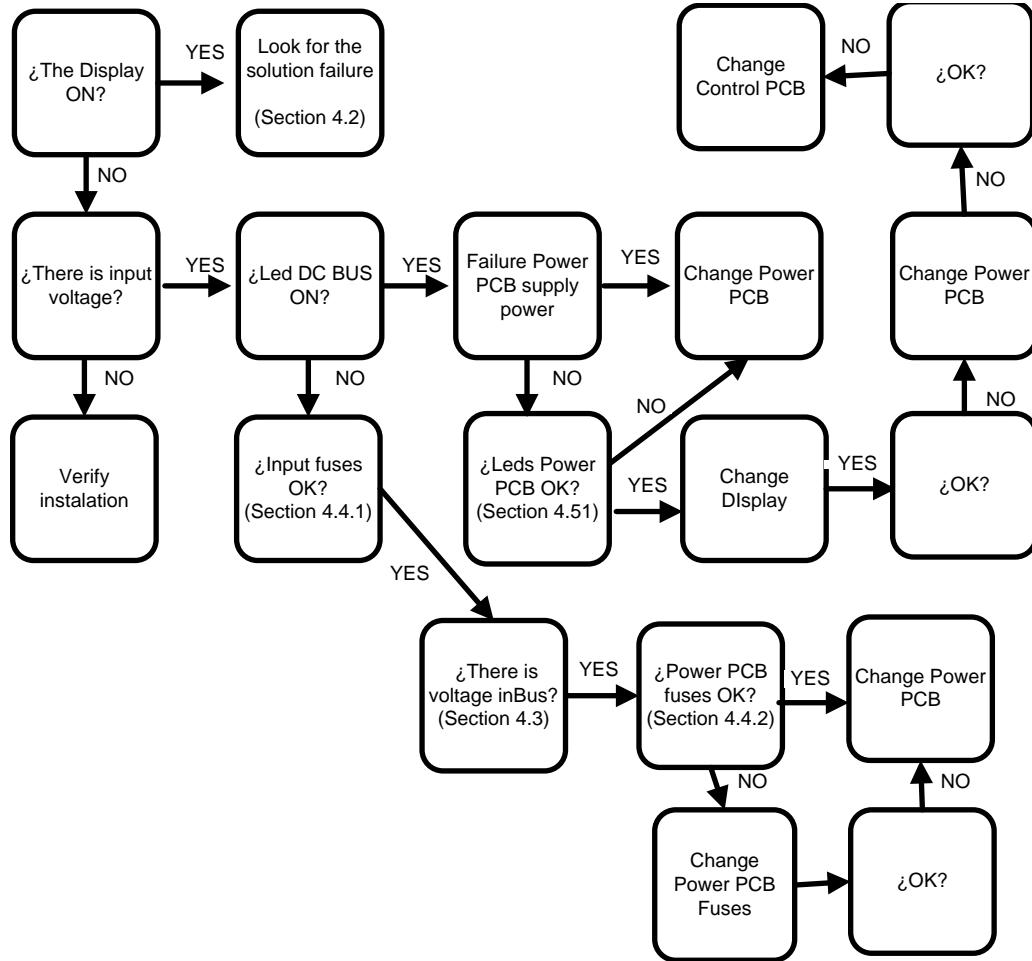


Figure 1.2. Display Fault

4.4. Fuses fault

The SDrive700 contains a certain number of fuses for safety reasons. The failure of a fuse is not a normal event, and is usually an indicative of further and more serious faults. For this reason fuses failure should be investigated.

Most of the auxiliary fuses are located in the SDrive PCB. A list of fuses, with their locations, possible reasons for failure and suggested corrective actions, follows.

4.4.1. Supply fuses

Function: Protect mains

Place: In the 3 SD700 input phases.

Possible reason for failure: Supply surge; Age or cyclic stress failure; wrong fuses; fault in supply cable; rectifier or inverter fault.

Action: Take out the covers and make a visual inspection. Check that there is no fire or a blast sign. Check the SD700 and follow *figure 1.3* instructions to verify that any short circuit occurred. Each test is carried out 3 times (i.e. once per phase), which makes a total of 12 test.

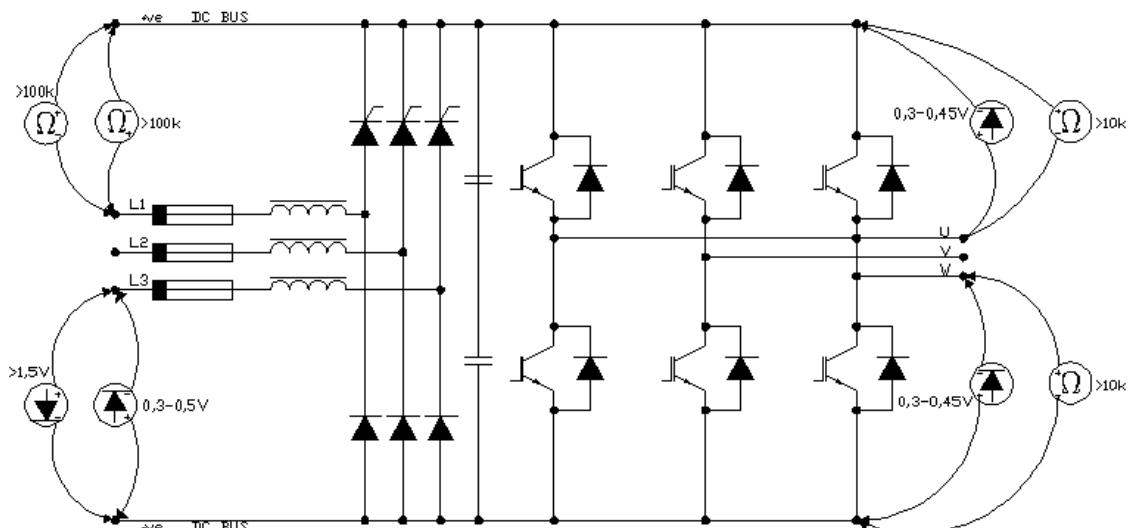


Figure 1.3. Display Fault

4.4.2 Fuses Frame 1

a) Fuses of the Power Board

In the power board, there are 2 fuses located where the figure 1.4 shows.

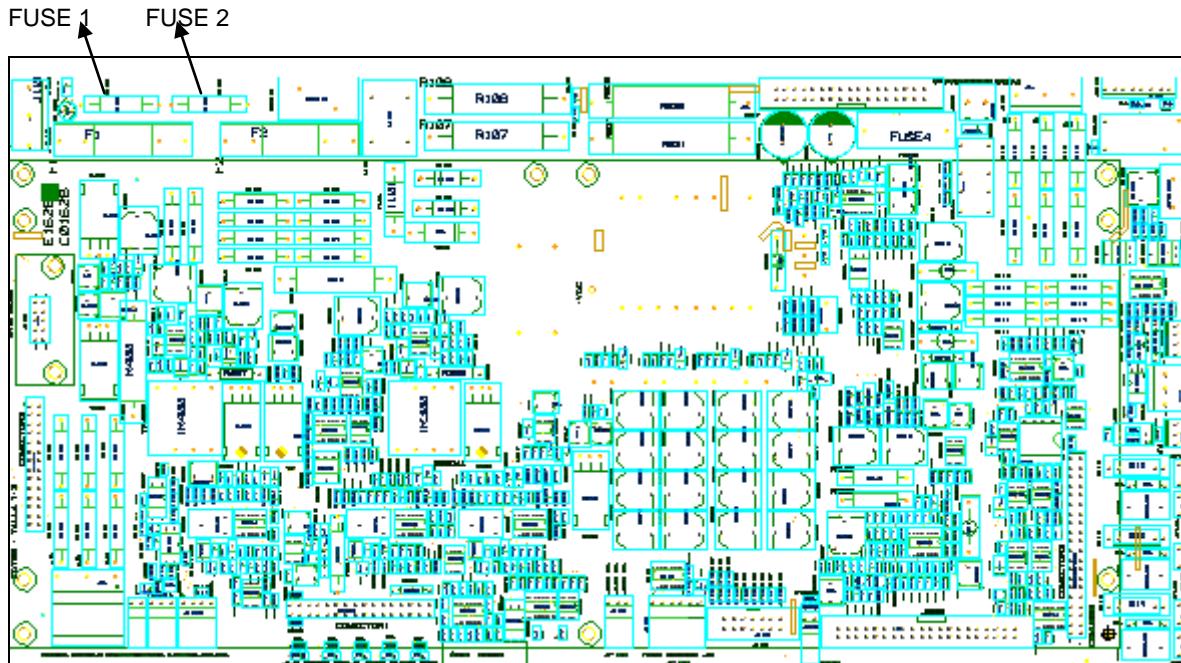


Figure 1.4 Fuses of the power board

Fuse 1 and Fuse 2:

Function: protection for the fast charge circuits of the bus on power board. Value of 4 A.

Possible reason for failure: Fuse fault or faulty circuit.

Action: Replace the fuse or the board.

b) Fuses of the Power Connection Board

In the power connection board, there are 3 fuses located where the figure 1.5 shows.

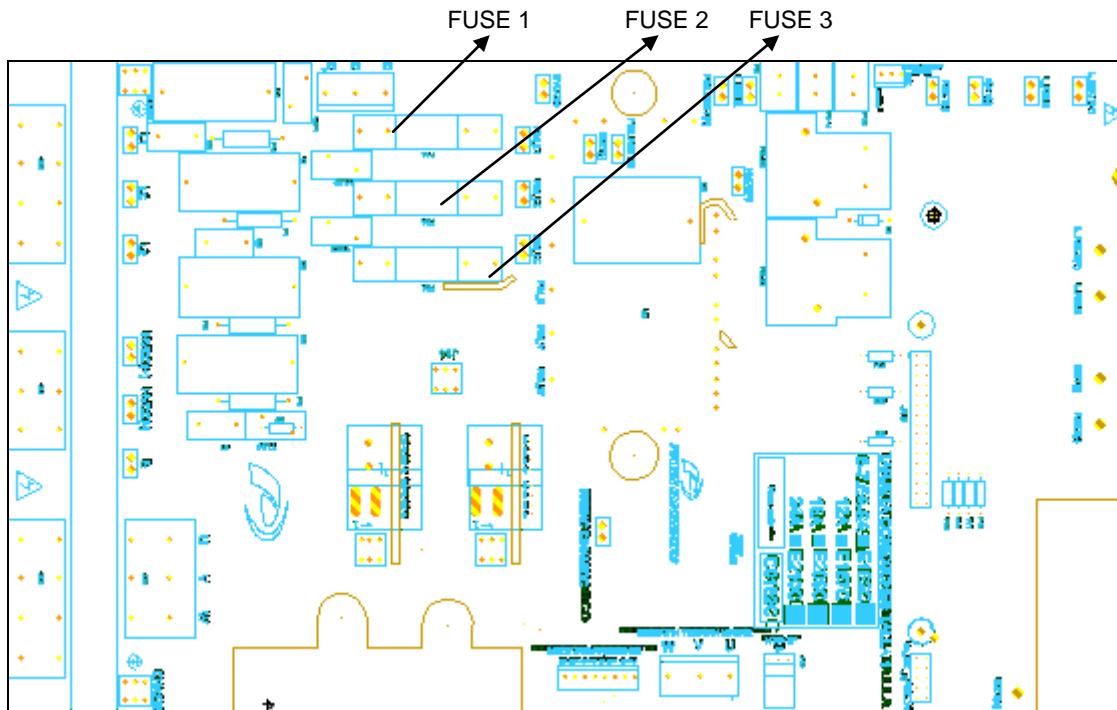


Figure 1.5. Fuses of the power connection board

Fuse 1, Fuse 2 and Fuse 3:

Function: Protection for input voltage measurement circuit before the chokes. Value of 2 A.

Possible reason for failure: Fuse fault or faulty circuit.

Action: Replace the fuse or the board.

4.4.3. Fuses Frame 2

a) Fuses of the Power Board

In the power board, there are 2 fuses located where the figure 1.4 shows.

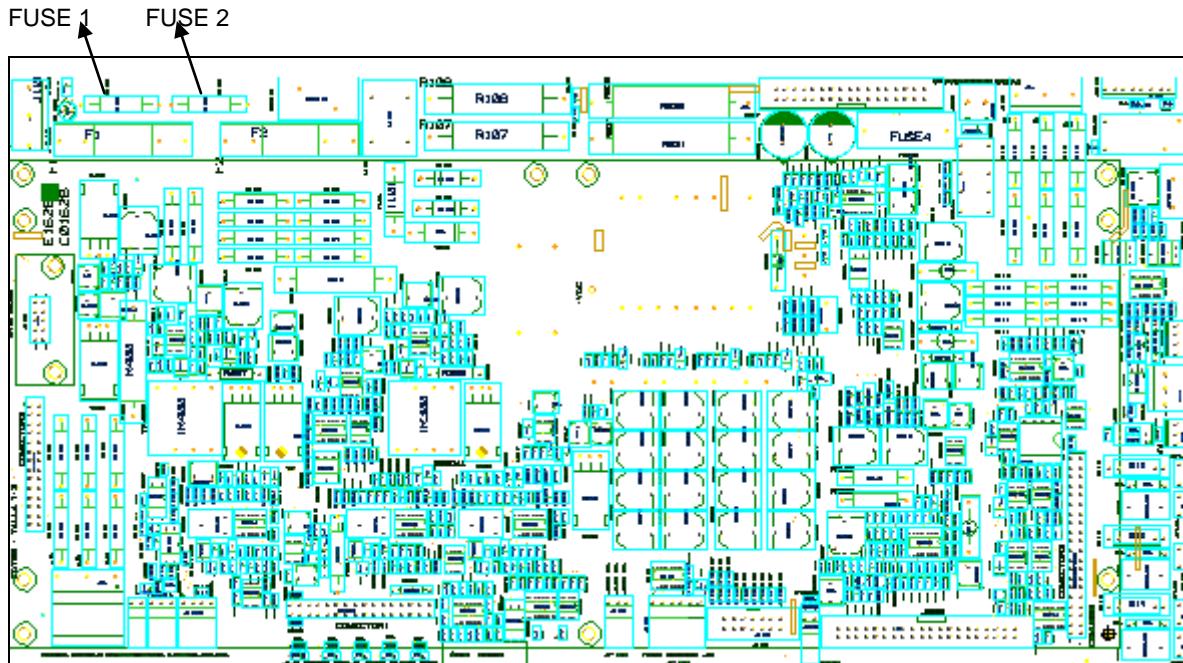


Figure 1.4 Fuses of the power board

Fuse 1 and Fuse 2:

Function: protection for the fast charge circuits of the bus on power board. Value of 4 A.

Possible reason for failure: Fuse fault or faulty circuit.

Action: Replace the fuse or the board.

b) Fuses of the Power Connection Board

In the power connection board, there are 3 fuses located where the figure 1.5 shows.

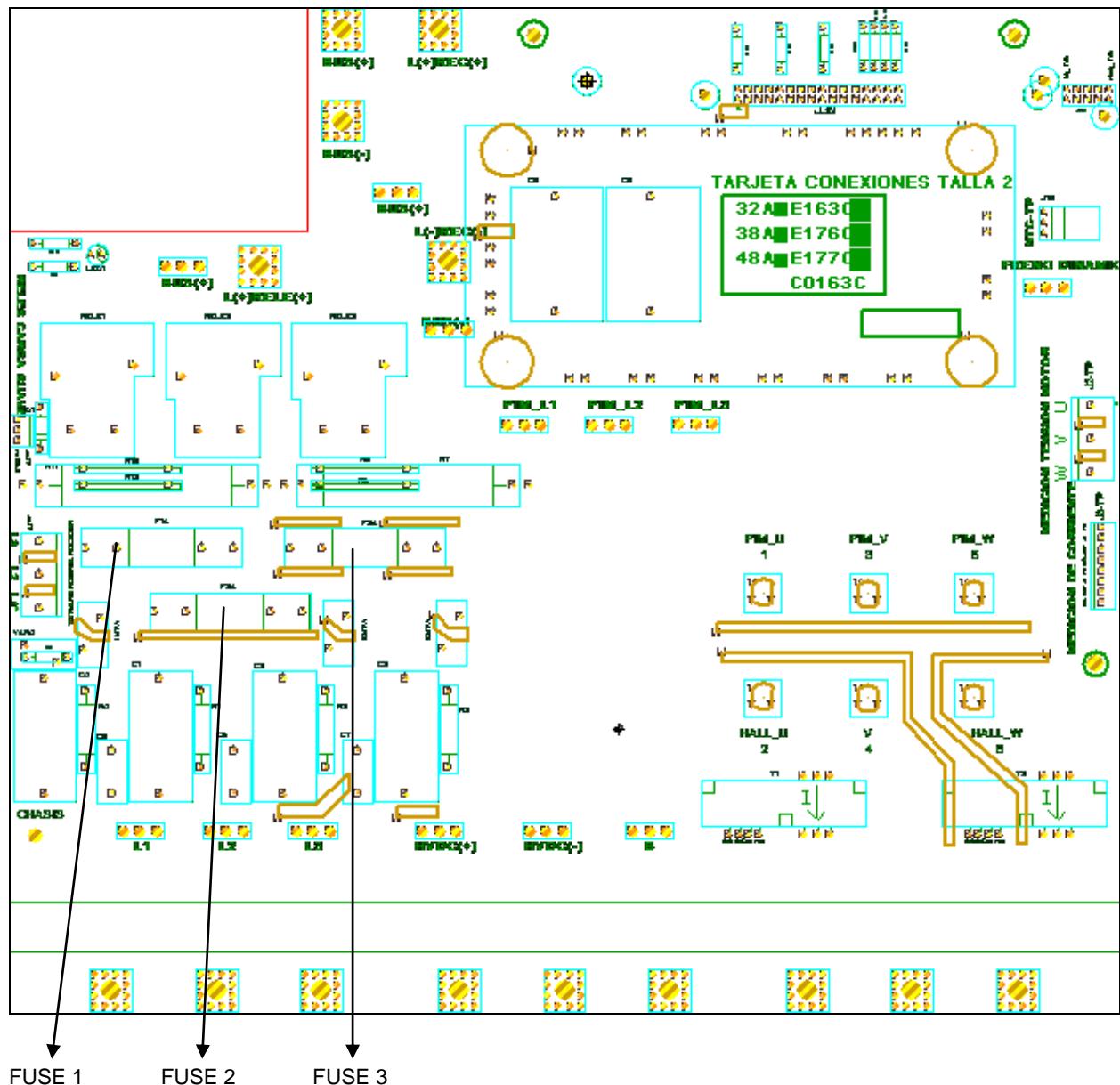


Figure 1.5. Fuses of the power connection board

Fuse 1, Fuse 2 and Fuse 3:

Function: Protection for input voltage measurement circuit before the chokes. Value of 2 A.

Possible reason for failure: Fuse fault or faulty circuit.

Action: Replace the fuse or the board.

4.4.3 Fuses Frame 3 (60 – 75A)

a) Fuses of the Power Board

In the power board, there are 6 fuses located where the figure 1.4 shows.

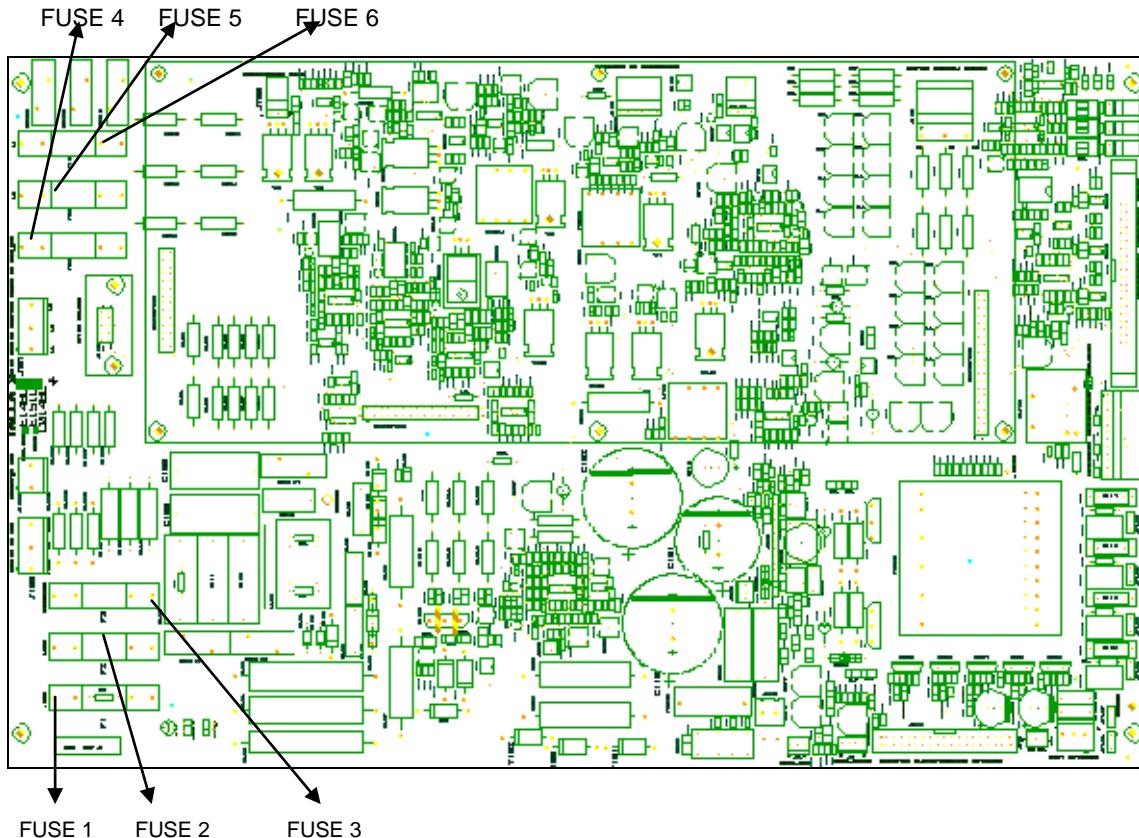


Figure 1.4 Fuses of the power board

Fuse 1 and Fuse 2:

Characteristics: They are very fast-acting ceramic fuses. Their value is 4 A.

Function: Power supply for the power board from its bus.

Possible reason for failure: Internal short-circuit in the power board.

Action: Replace the power board.

Fuse 3:

Characteristics: glass tube fuse. The value is 100 mA.

Function: It discharges the bus of the drive.

Possible reason for failure: Faulty circuit and bus always discharging.

Action: Replace the power board.

Fuse 4, Fuse 5 and Fuse 6:

Function: protection for input voltage measurement circuit before chokes and detection of input voltage to avoid the discharge of the bus. The value is 2 A.

Possible reason for failure: Circuit fault or faulty fuse.

Action: Replace the fuse or the board.

b) Fuses of the Power Connection Board

In the power connection board, there are 3 fuses located where the figure 1.5 shows.

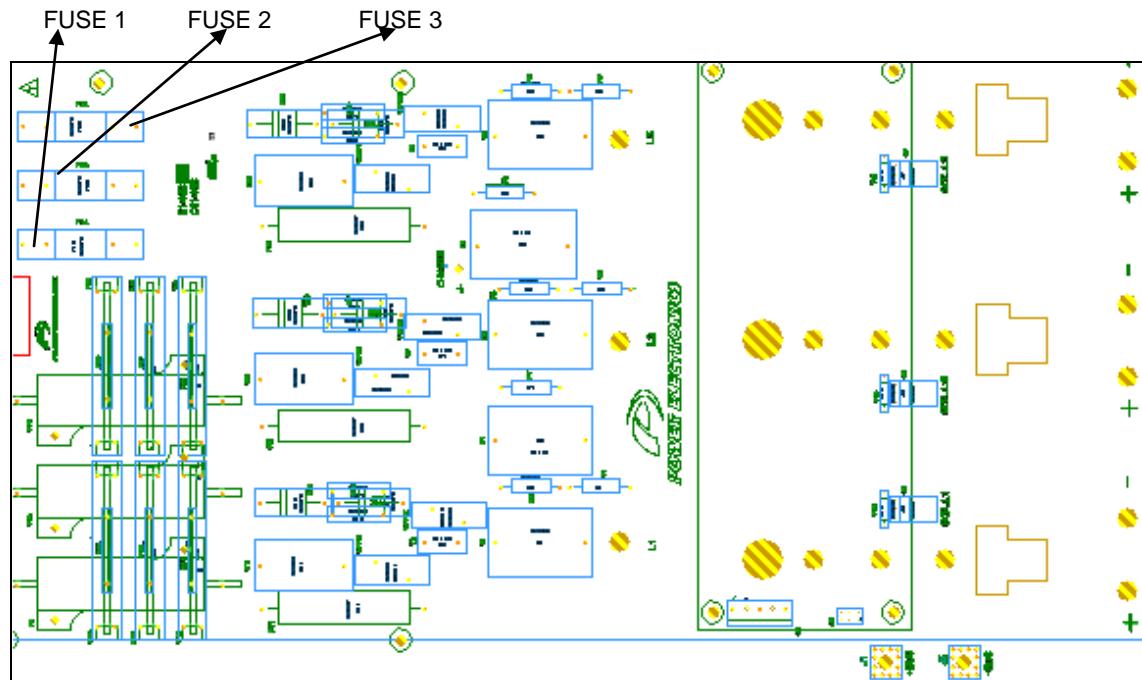


Figure 1.5. Fuses of the power connection board

Fuse 1, Fuse 2 and Fuse 3:

Function: Protection for soft-load circuits. The value is 4 A.

Possible reason for failure: Fuse fault or faulty circuit.

Action: Replace the fuse or the board.

4.4.4 Fuses Frame 3 (90 -115A)

a) Fuses of the Power Board

In the power board, there are 6 fuses located where the figure 1.4 shows.

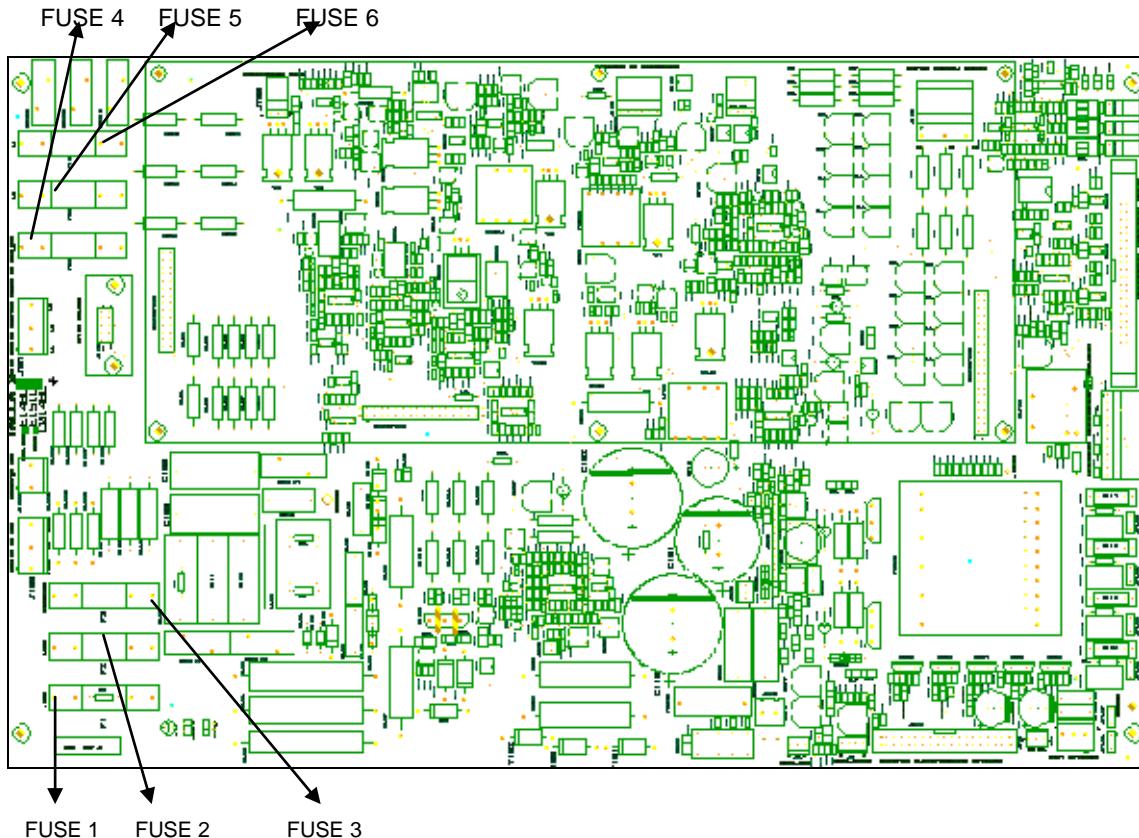


Figure 1.4 Fuses of the power board

Fuse 1 and Fuse 2:

Characteristics: They are very fast-acting ceramic fuses. Their value is 4 A.

Function: Power supply for the power board from its bus.

Possible reason for failure: Internal short-circuit in the power board.

Action: Replace the power board.

Fuse 3:

Characteristics: glass tube fuse. The value is 100 mA.

Function: It discharges the bus of the drive.

Possible reason for failure: Faulty circuit and bus always discharging.

Action: Replace the power board.

Fuse 4, Fuse 5 and Fuse 6:

Function: protection for input voltage measurement circuit before chokes and detection of input voltage to avoid the discharge of the bus. The value is 2 A.

Possible reason for failure: Circuit fault or faulty fuse.

Action: Replace the fuse or the board.

b) Fuses of the Power Connection Board

In the power connection board, there are 3 fuses located where the figure 1.5 shows.

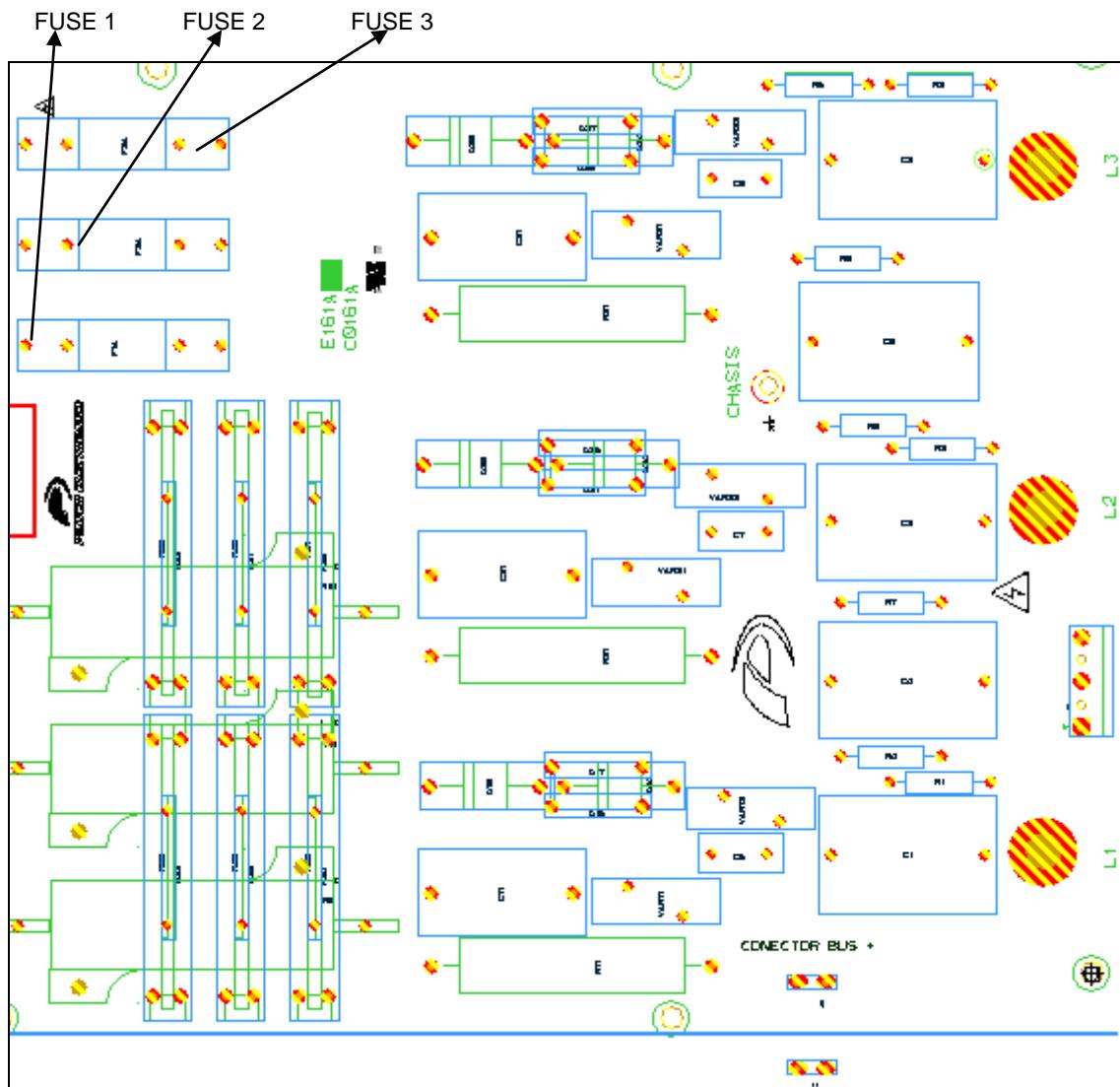


Figure 1.5. Fuses of the power connection board

Fuse 1, Fuse 2 and Fuse 3:

Function: Protection for soft-load circuits. The value is 4 A.

Possible reason for failure: Fuse fault or faulty circuit.

Action: Replace the fuse or the board.

4.4.5 Fuses Frame 4 - Frame 11 (400VAC)

a) Fuses of the Power Board

There are 4 fuses in the Power PCB, as it is showed in *figure 1.4*:

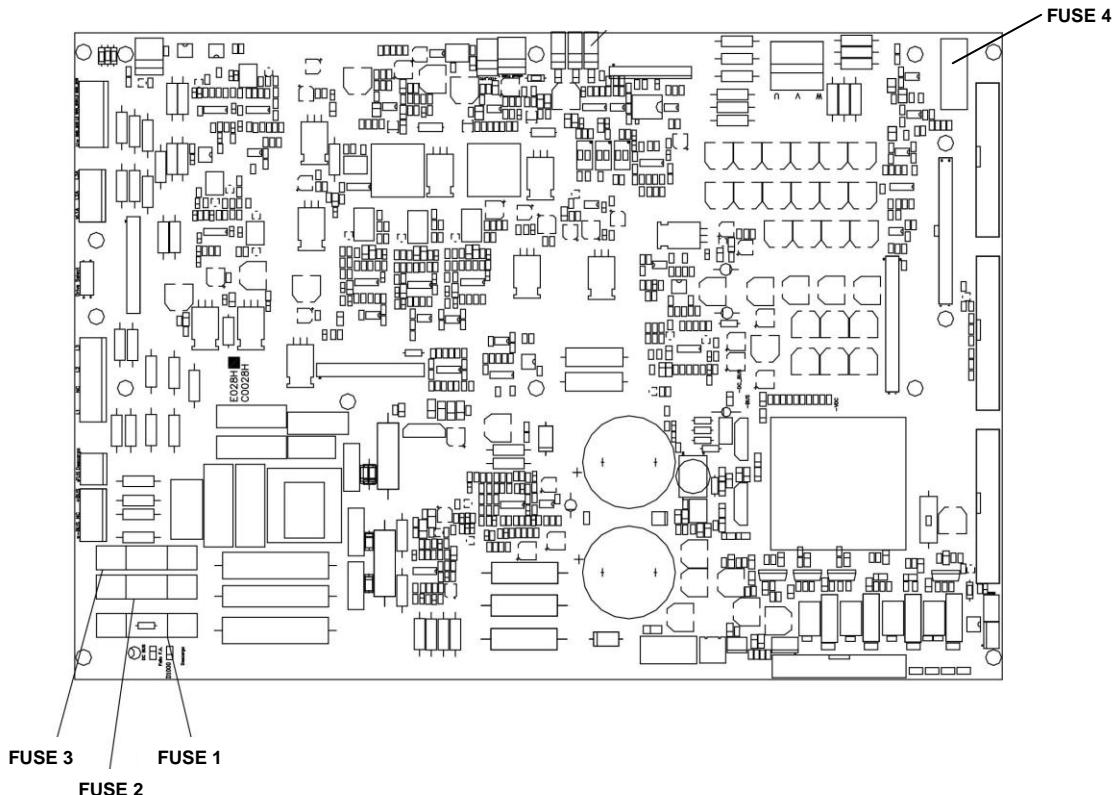


Figure 1.4. Power PCB fuses

Fuse 1 and Fuse 2:

Characteristics: These are ultrarrapid ceramic fuses. These fuses are 4A

Function: Power supply PCB from the Power PCB's Bus.

Possible reason for failure: Short circuit in the Power PCB

Action: Change the Power PCB.

Fuse 3:

Characteristics: These are ultrarrapid ceramic fuses. Its value is 4A

Function: DC Bus Discharge.

Possible reason for failure: Circuit damaged and DC Bus always discharged.

Action: Change the Power PCB.

Fuse 4:

Características: Glass fuse. This is a 2A fuse.

Function: 15V_IGBT supply

Possible reason for failure: IGBT damaged.

Action: Check IGBTs (Section 6.4)

b) Snubber PCB

FRAME 4

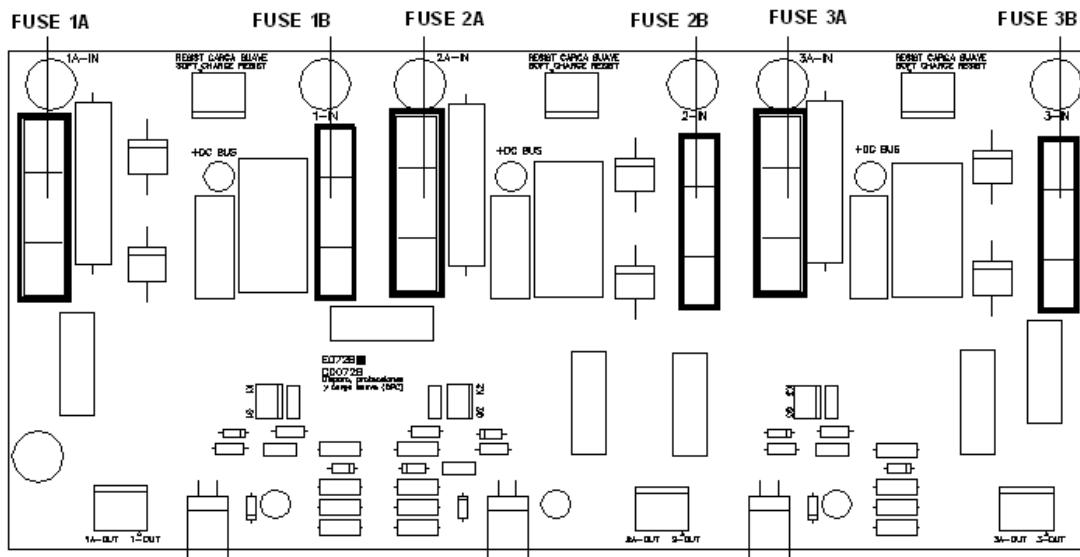


Figure 1.5. Frame 4 Snubber PCB fuses

FRAME 5,6,7,8

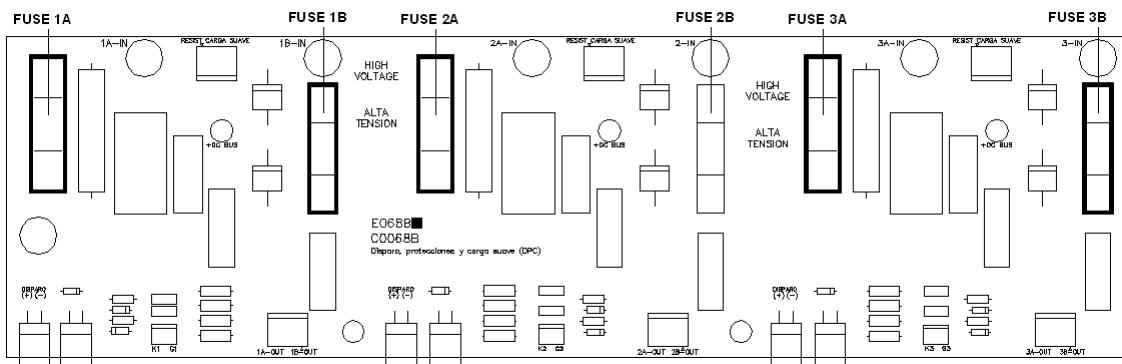


Figure 1.6. Frame 5,6,7,8 Snubber PCB fuses

Fuse 1A, 2A, 3A:

Characteristics: These are ultrarrapid ceramic fuses. These fuses are 4A

Function: 1) Soft circuit charge protection, 2) Protection of the input voltage measure circuit after the AC choke

Possible reason for failure: Short circuit in the Power PCB

Action: Change the Power PCB.

Fuse 1B, 2B, 3B:

Characteristics: These are ultrarrapid ceramic fuses. Their value depends on the device

Function: Protection of the input voltage measure circuit before the AC choke

Possible reason for failure: Short circuit in the Power PCB

Action: Change the Power PCB.

c) Fans Power Supply.

There are 3 fuses with the same function:

Function: Fan's power supply protection

Possible reason for failure: Short circuit in the fans power supply

Action: Change the fans power supply.

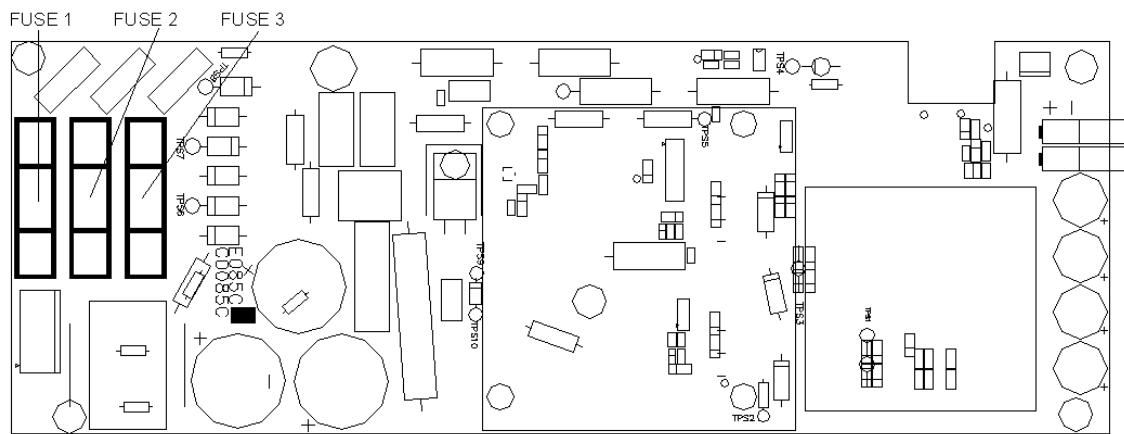


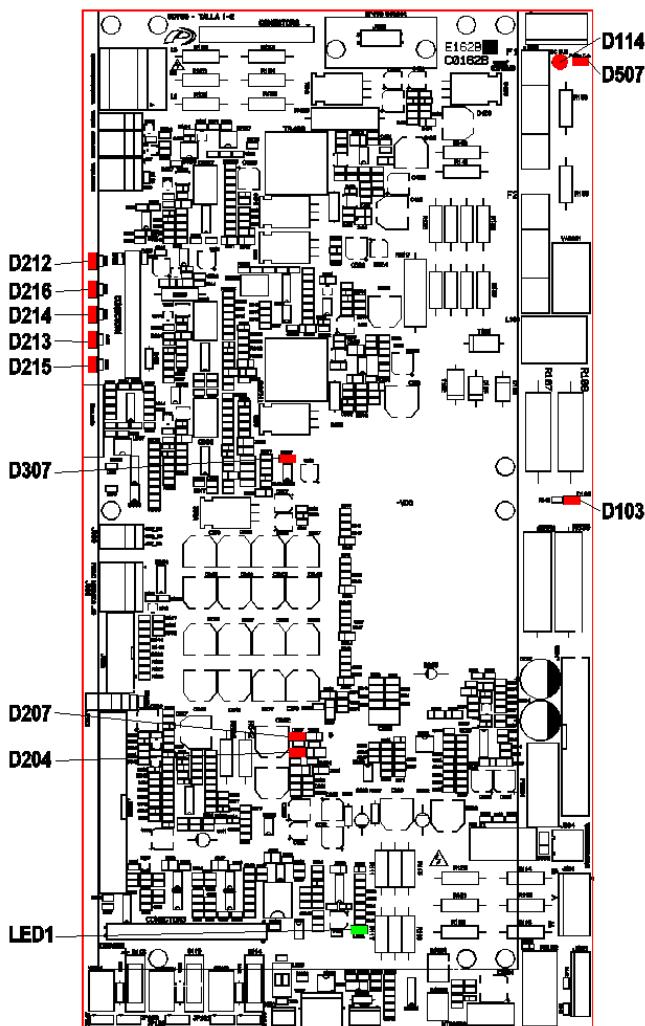
Figure 1.7. Fans power supply fuses

4.5 Indicator Leds

4.5.1 Indicator Leds Frame 1

a) Indicator Leds of Power Board

The PCB's of the SD700 drives have several leds which report us about the operation of the drive, and can give us the information about the component that operates wrongly.



is always ON. It indicates +24V Control.

- **D215:** RED colour. In normal operation it is always ON. It indicates +15V IGBT.
- **D307:** RED colour. In normal operation it is always ON. It indicates +8V User.
- **D207:** RED colour. In normal operation it is always ON. It indicates -15V Dynamic Brake.
- **D204:** RED colour. In normal operation it is always ON. It indicates +15V Dynamic Brake.
- **LED1:** GREEN colour. In normal operation it is always ON. It indicates detection from the IGBT thermal protection.

- **D114:** RED colour. In normal operation, it is always ON. It indicates that DC Bus is charged. When it is OFF, the Bus is completely discharged.

- **D507:** RED colour. In normal operation, it is always OFF. It is blinking if there is a fault in the main power supply. This fault can be:

- High Bus voltage
- Low Bus voltage;
- High internal temperature of the drive;
- Short-circuit in the main power supply of the power board.

- **D103:** RED colour. In normal operation it is always ON. It indicates that the bus of the power board is powered.

- **D212:** RED colour. In normal operation it is always ON. It indicates +24V Fans OK.

- **D216:** RED colour. In normal operation it is always ON. It indicates +28V Display Power.

- **D214:** RED colour. In normal operation it is always ON. It indicates +24V User.

- **D213:** RED colour. In normal operation it

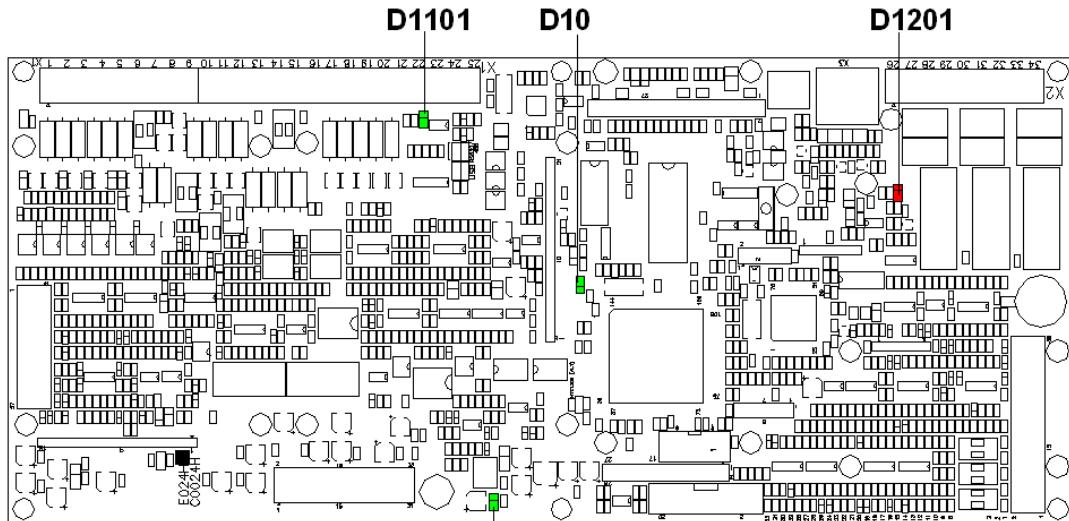
b) Indicator Leds of Control Board

Figure 1.7. Leds of Control Board

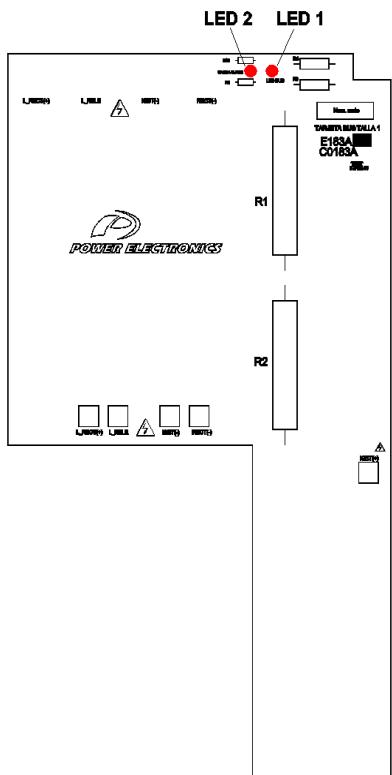
LED 10: GREEN colour. In normal operation, it is blinking. It indicates that the microprocessor is operating correctly.

LED 901: GREEN colour. In normal operation it is always ON. It indicates that the power supply for the DSP (3,3V) is correct.

LED 1101: GREEN colour. In normal operation, it is always OFF. It is lit if there is overheating in the integrated circuit for RS485 communications.

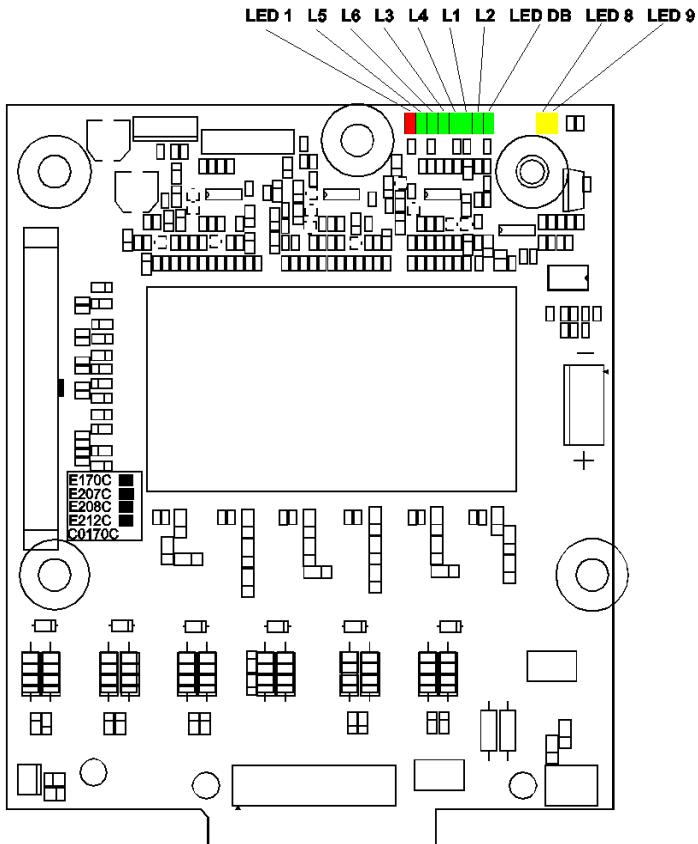
LED 1201: RED colour. In normal operation, it is always OFF. It is lit when the Hardware current limitation is performing.

c) Dc Bus Board Frame 1



- **LED 1:** RED colour. In normal operation it is always ON. It indicates that DC Bus is powered.
- **LED 2:** RED colour. In normal operation, it is ON during the soft charge, and once the DC Bus is charged, the led becomes OFF.

d) Gate Drive Board Frame 1



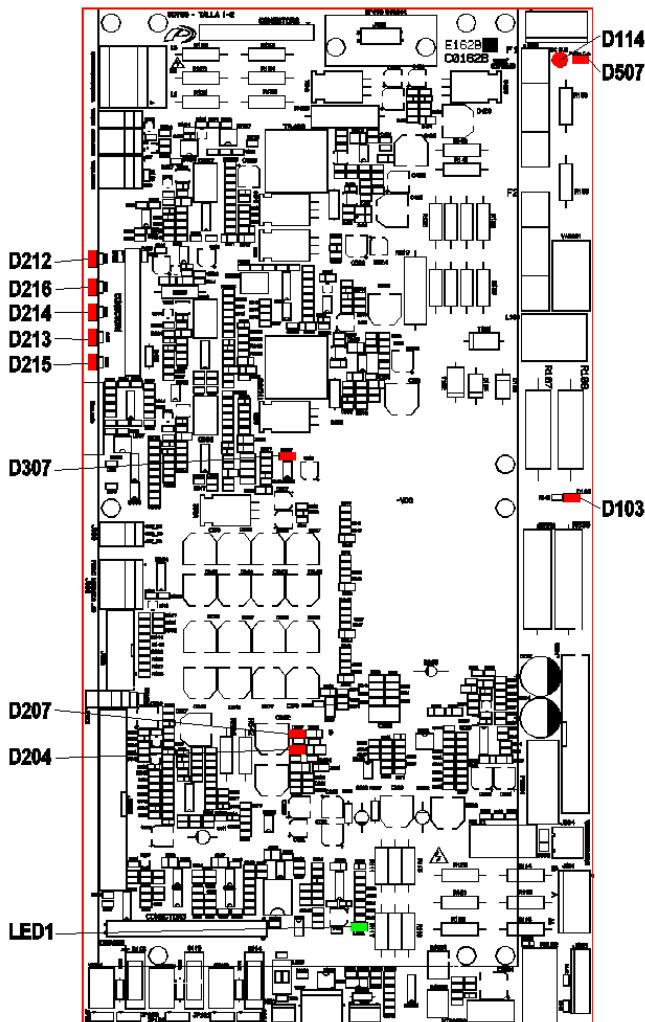
- **LED 1:** RED colour. In normal operation, it is always ON. It indicates +15V IGBT FUSE.
- **L1:** GREEN colour. In normal operation, it is always ON. It indicates desaturation W +.
- **L2:** GREEN colour. In normal operation, it is always ON. It indicates desaturation W -.
- **L3:** GREEN colour. In normal operation, it is always ON. It indicates desaturation V +.
- **L4:** GREEN colour. In normal operation, it is always ON. It indicates desaturation V -.
- **L5:** GREEN colour. In normal operation, it is always ON. It indicates desaturation U +.
- **L6:** GREEN colour. In normal operation, it is always ON. It indicates desaturation U -.
- **LED DB:** GREEN colour. In normal operation, it is always ON. It indicates braking desaturation fault, in this case it becomes OFF.
- **LED 8:** YELLOW colour. In normal operation, it is always ON. It indicates +15V dynamic brake.
- **LED 9:** YELLOW colour. In normal operation, it is always ON. It indicates - 15V dynamic brake.

NOTE: Leds L1, L2, L3, L4, L5, L6 and LED DB become OFF during 1s when saturation.

4.5.2 Indicator Leds Frame 2

a) Indicator Leds of Power Board

The PCB's of the SD700 drives have several leds which report us about the operation of the drive, and can give us the information about the component that operates wrongly.



is always ON. It indicates +24V Control.

- **D215:** RED colour. In normal operation it is always ON. It indicates +15V IGBT.
- **D307:** RED colour. In normal operation it is always ON. It indicates +8V User.
- **D207:** RED colour. In normal operation it is always ON. It indicates -15V Dynamic Brake.
- **D204:** RED colour. In normal operation it is always ON. It indicates +15V Dynamic Brake.
- **LED1:** GREEN colour. In normal operation it is always ON. It indicates detection from the IGBT thermal protection.

- **D114:** RED colour. In normal operation, it is always ON. It indicates that DC Bus is charged. When it is OFF, the Bus is completely discharged.

- **D507:** RED colour. In normal operation, it is always OFF. It is blinking if there is a fault in the main power supply. This fault can be:

- High Bus voltage
- Low Bus voltage;
- High internal temperature of the drive;
- Short-circuit in the main power supply of the power board.

- **D103:** RED colour. In normal operation it is always ON. It indicates that the bus of the power board is powered.

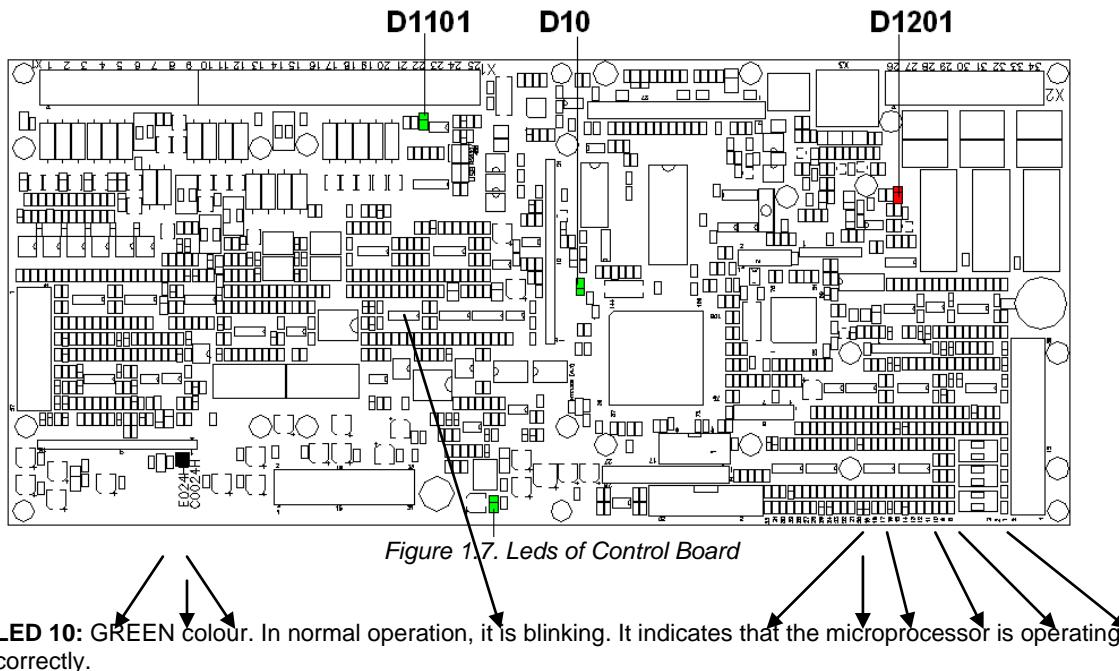
- **D212:** RED colour. In normal operation it is always ON. It indicates +24V Fans OK.

- **D216:** RED colour. In normal operation it is always ON. It indicates +28V Display Power.

- **D214:** RED colour. In normal operation it is always ON. It indicates +24V User.

- **D213:** RED colour. In normal operation it

b) Indicator Leds of Control Board



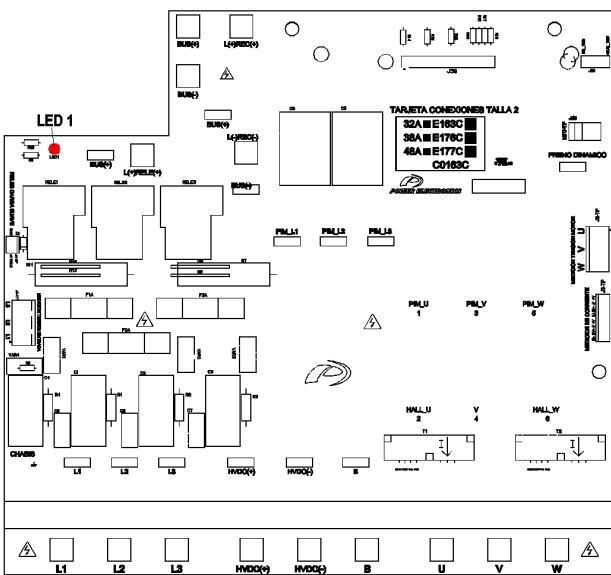
LED 10: GREEN colour. In normal operation, it is blinking. It indicates that the microprocessor is operating correctly.

LED 901: GREEN colour. In normal operation it is always ON. It indicates that the power supply for the DSP (3,3V) is correct.

LED 1101: GREEN colour. In normal operation, it is always OFF. It is lit if there is overheating in the integrated circuit for RS485 communications.

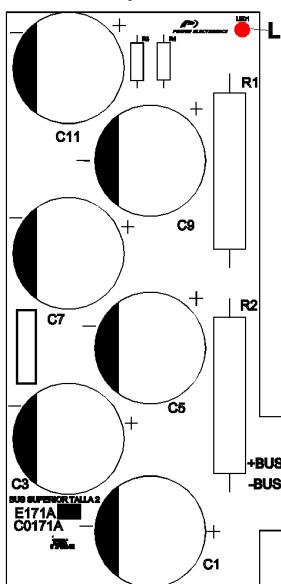
LED 1201: RED colour. In normal operation, it is always OFF. It is lit when the Hardware current limitation is performing.

c) Power Connection Board



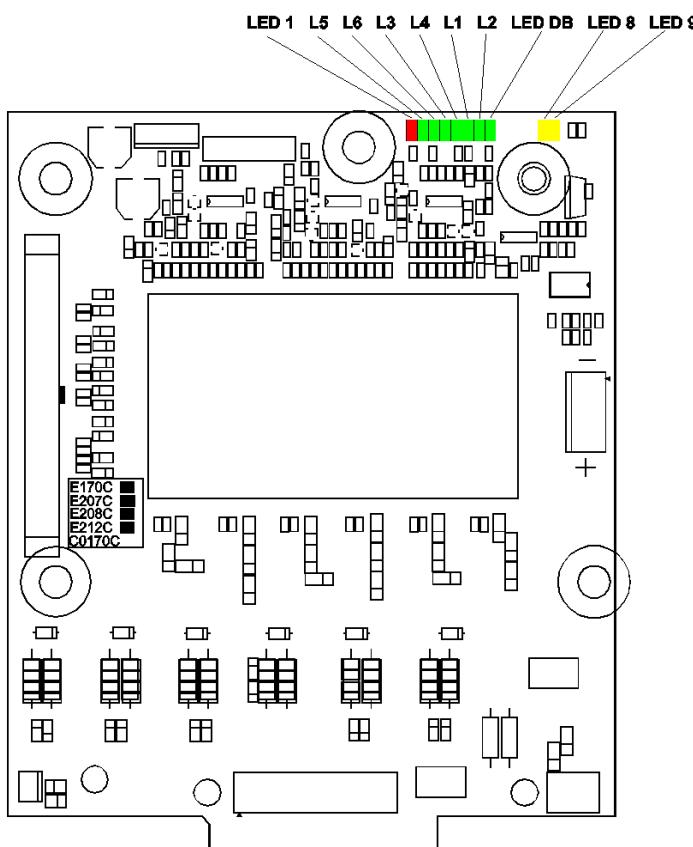
- **LED1:** RED colour. In normal operation, it is ON during the soft charge, and once the DC Bus is charge, the led becomes OFF.

d) Dc Bus Board Frame 2



LED 1: RED colour. In normal operation it is always ON. It indicates that DC Bus is powered.

e) Gate Drive Board Frame 2



- **LED 1:** RED colour. In normal operation, it is always ON. It indicates +15V IGBT FUSE.
- **L1:** GREEN colour. In normal operation, it is always ON. It indicates desaturation W +.
- **L2:** GREEN colour. In normal operation, it is always ON. It indicates desaturation W -.
- **L3:** GREEN colour. In normal operation, it is always ON. It indicates desaturation V +.
- **L4:** GREEN colour. In normal operation, it is always ON. It indicates desaturation V -.
- **L5:** GREEN colour. In normal operation, it is always ON. It indicates desaturation U +.
- **L6:** GREEN colour. In normal operation, it is always ON. It indicates desaturation U -.
- **LED DB:** GREEN colour. In normal operation, it is always ON. It indicates braking desaturation fault, in this case it becomes OFF.

- **LED 8:** YELLOW colour. In normal operation, it is always ON. It indicates +15V dynamic brake.
- **LED 9:** YELLOW colour. In normal operation, it is always ON. It indicates - 15V dynamic brake.

NOTE: Leds L1, L2, L3, L4, L5, L6 and LED DB become OFF during 1s when saturation.

4.5.3 Indicator Leds Frame 3 (60-75A)

a) Indicator Leds of Power Board

The PCB's of the SD700 drives have several leds which report us about the operation of the drive, and can give us the information about the component that operates wrongly.

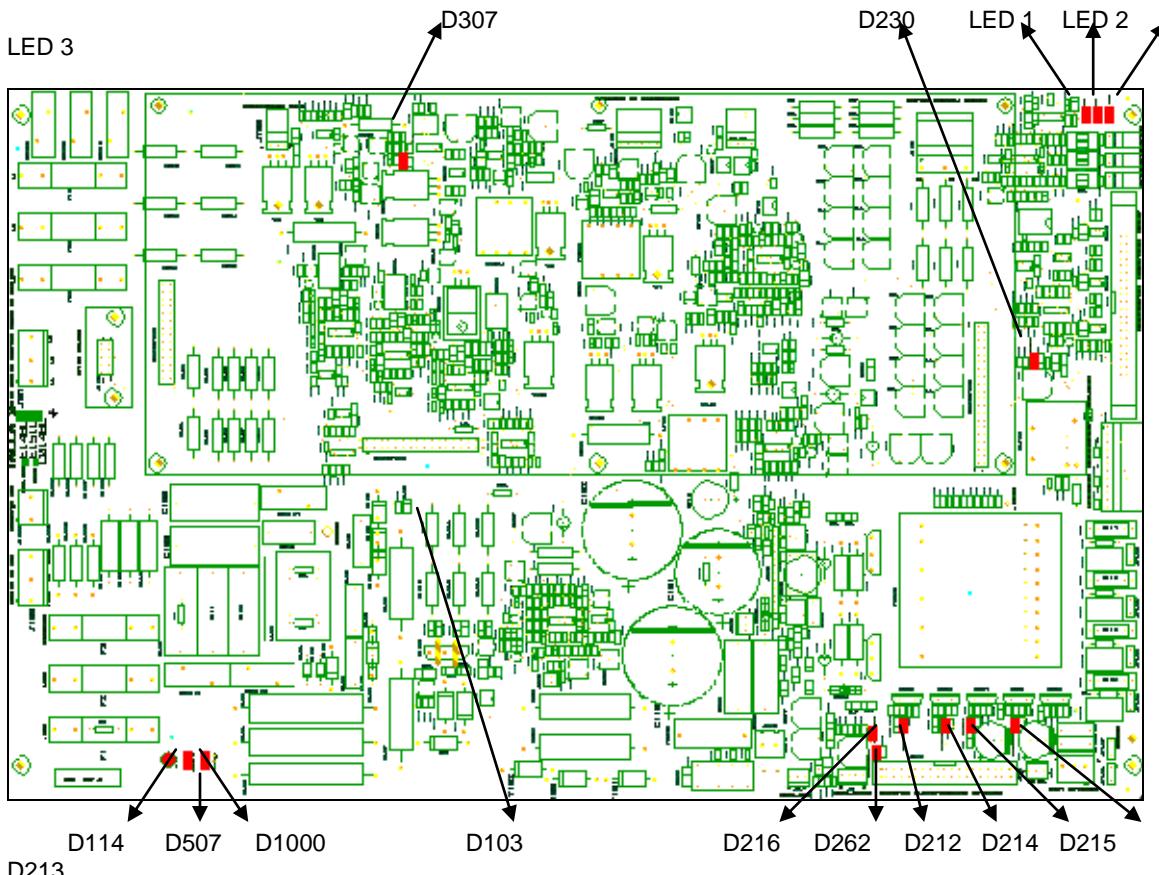


Figure 1.6. Leds of the power board

D114: RED colour. In normal operation, it is always ON. It indicates that DC Bus is charged. When it is OFF, the Bus is completely discharged.

D507: RED colour. In normal operation, it is always OFF. It is blinking if there is a fault in the main power supply. This fault can be:

- High Bus voltage.
- Low Bus voltage.
- High internal temperature of the drive.
- Short-circuit in the main power supply of the power board.

D1000: GREEN colour. In normal operation, it is always OFF. It is lit when the discharging circuit for the DC BUS is active.

D307: RED colour. In normal operation, it is always ON. It indicates that the power supply +8V_USR is correct. If it is not lit, it indicates there are problems in the user power supply (+5V_USR and +5V_COM).

D103: RED colour. In normal operation, it is always ON. It indicates that the internal Bus of the power board is charged. If it is not lit, the main power supply is not operating.

D262: RED colour. In normal operation, it is always ON. It indicates that the power supply +28V_DISP_PWR is correct. If it is not lit, the Display is not powered.

D216: RED colour. In normal operation, it is always ON. It indicates that the power supply +24V_DISP_COM is correct. If it is not lit, there is a communication fault between the Display and the Control Board.

D212: RED colour. In normal operation, it is always ON. It indicates that the power supply +15V_SCR is correct. If it is not lit, it indicates there are problems in the triggering thyristor pulse generator circuit.

D214: RED colour. In normal operation, it is always ON. It indicates that the power supply +28V_USR is correct. If it is not lit, all the voltages referred to the user ground disappear.

D215: RED colour. In normal operation, it is always ON. It indicates that the power supply +15V_IGBT is correct. If it is not lit, there are not pulses in the IGBT's. There is some faulty component in the inverter circuit (IGBTs, GateDrive...).

D213: RED colour. In normal operation, it is always ON. It indicates that the power supply +24V_CONTROL is correct. If it is not lit, all the voltages referred to the analogue and digital ground disappear.

D230: RED colour. In normal operation, it is always ON. It indicates that the power supply +15V_TEMP is correct. If it is not lit, the temperature measurement faults.

LED 1, LED2 AND LED 3: GREEN colour. It is only lit one of them, and corresponds to the output phase (IGBT's) with higher temperature.

b) Indicator Leds of Control Board

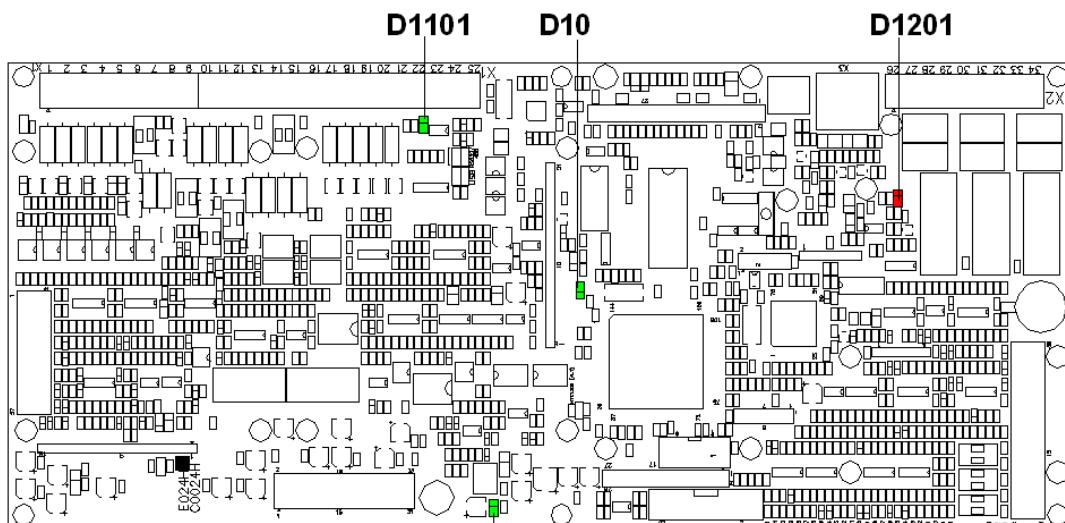


Figure 1.7. Leds of the Control Board

LED 10: GREEN colour. In normal operation, it is blinking. It indicates that the microprocessor is operating correctly.

LED 901: GREEN colour. In normal operation, it is always ON. It indicates that the power supply for the DSP (3,3V) is correct.

LED 1101: GREEN colour. In normal operation, it is always OFF. It is lit if there is overheating in the integrated circuit for RS485 communications.

LED 1201: RED colour. In normal operation, it is always OFF. It is lit when the Hardware current limitation is performing.

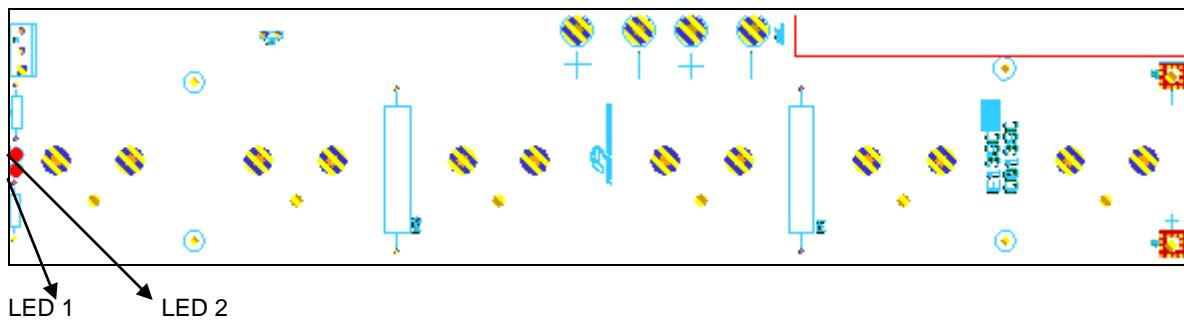
c) Indicator Leds of Dc Bus Board

Figure 1.8. Leds of DC BUS

LED 1: RED colour. In normal operation it is always ON. It indicates that DC Bus is powered.

LED 2: RED colour. In normal operation, it is ON during the soft charge, and once the DC Bus is charged, the led becomes OFF.

d) Indicator Leds of Pluggable Pcb of Trigger Thyristors

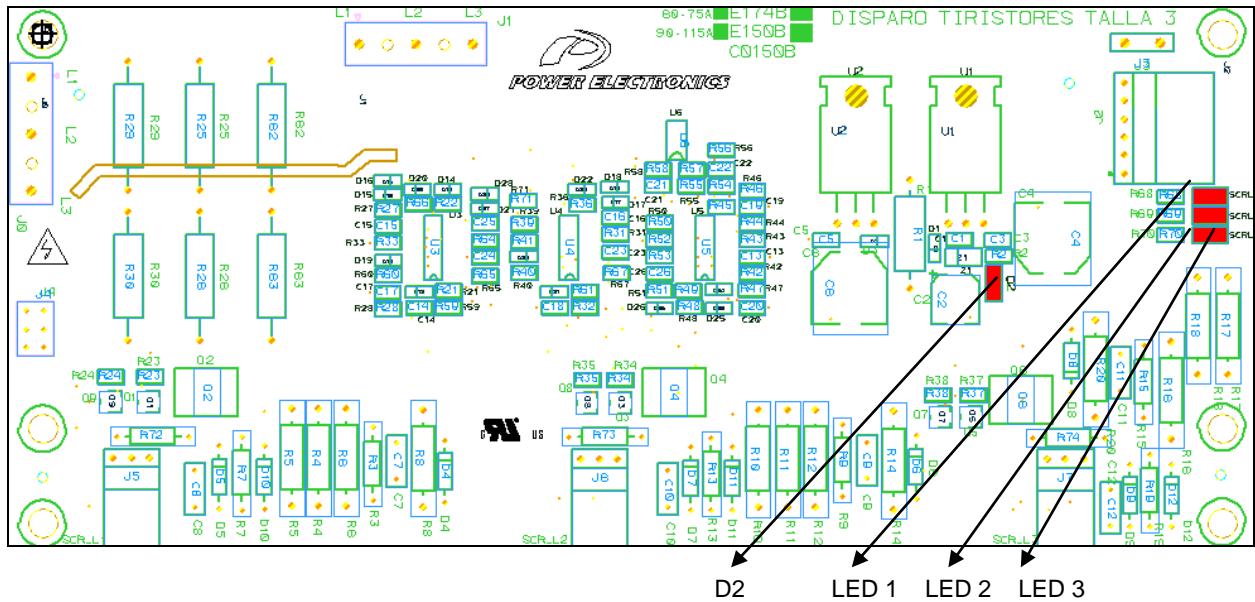


Figure 1.9. Leds of pluggable PCB of trigger thyristors

D2: RED colour. It reports us that the power supply for the triggering of the thyristors is correct (+5v_SCR).

LED 1, LED 2 AND LED 3: GREEN colour. They report us that the triggerings of the thyristors are being correctly performed.

e) Indicator Leds of the Upper Gate Drive Board

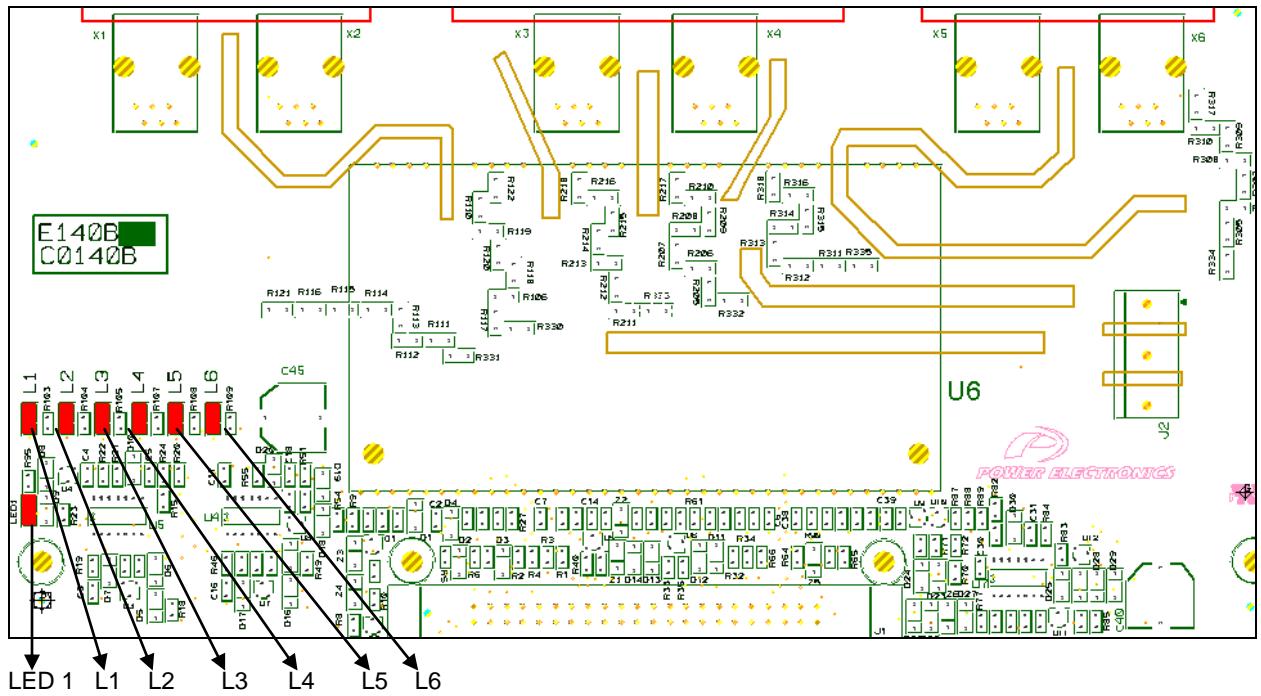


Figure 2.0. Upper gate drive board

LED 1: RED colour. In normal operation, it is always ON. It indicates +15V IGBT FUSE.

L1: GREEN colour. In normal operation, it is always ON. It indicates desaturation W +.

L2: GREEN colour. In normal operation, it is always ON. It indicates desaturation W -.

L3: GREEN colour. In normal operation, it is always ON. It indicates desaturation V +.

L4: GREEN colour. In normal operation, it is always ON. It indicates desaturation V -.

L5: GREEN colour. In normal operation, it is always ON. It indicates desaturation U +.

L6: GREEN colour. In normal operation, it is always ON. It indicates desaturation U -.

4.5.4 Indicator Leds Frame 3 (90-115A)

a) Indicator Leds of Power Board

The PCB's of the SD700 drives have several leds which report us about the operation of the drive, and can give us the information about the component that operates wrongly.

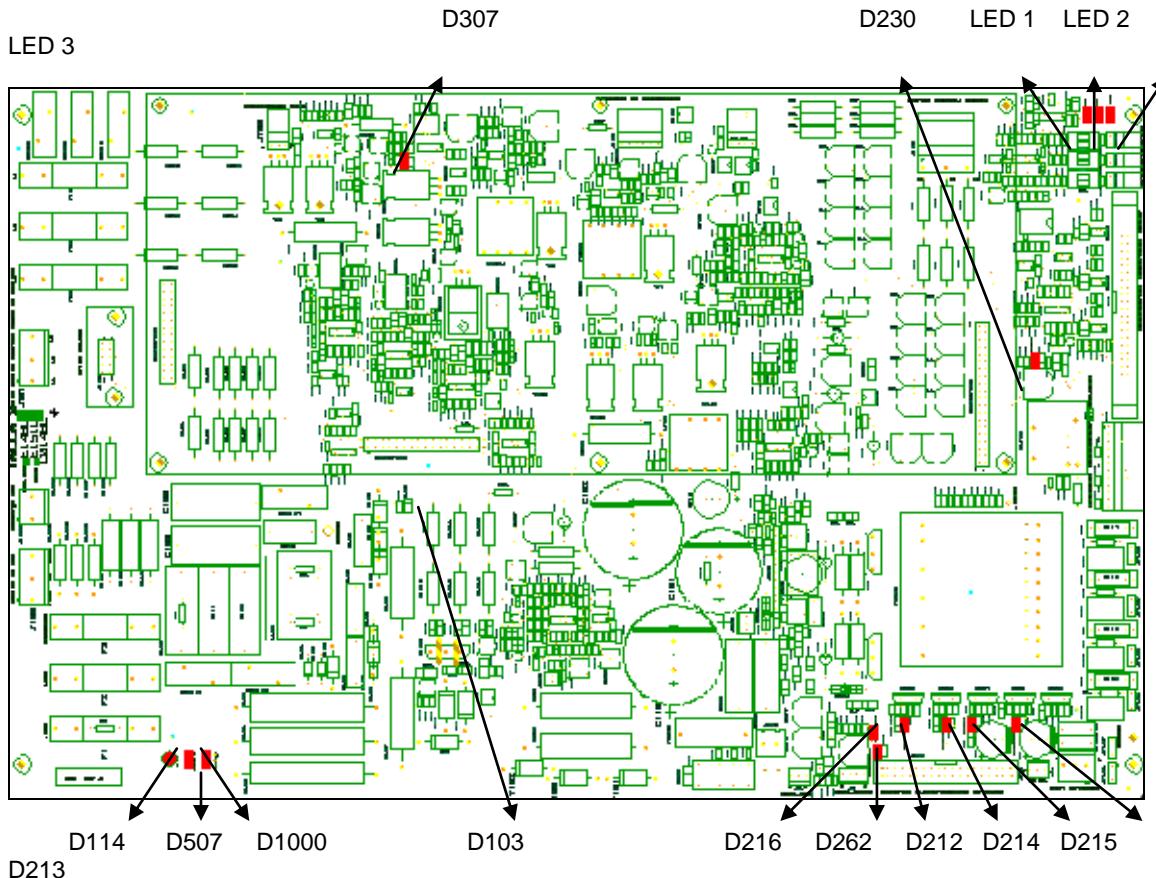


Figure 1.6. Leds of the power board

D114: RED colour. In normal operation, it is always ON. It indicates that DC Bus is charged. When it is OFF, the Bus is completely discharged.

D507: RED colour. In normal operation, it is always OFF. It is blinking if there is a fault in the main power supply. This fault can be:

- High Bus voltage.
- Low Bus voltage.
- High internal temperature of the drive.
- Short-circuit in the main power supply of the power board.

D1000: GREEN colour. In normal operation, it is always OFF. It is lit when the discharging circuit for the DC BUS is active.

D307: RED colour. In normal operation, it is always ON. It indicates that the power supply +8V_USR is correct. If it is not lit, it indicates there are problems in the user power supply (+5V_USR and +5V_COM).

D103: RED colour. In normal operation, it is always ON. It indicates that the internal Bus of the power board is charged. If it is not lit, the main power supply is not operating.

D262: RED colour. In normal operation, it is always ON. It indicates that the power supply +28V_DISP_PWR is correct. If it is not lit, the Display is not powered.

D216: RED colour. In normal operation, it is always ON. It indicates that the power supply +24V_DISP_COM is correct. If it is not lit, there is a communication fault between the Display and the Control Board.

D212: RED colour. In normal operation, it is always ON. It indicates that the power supply +15V_SCR is correct. If it is not lit, it indicates there are problems in the triggering thyristor pulse generator circuit.

D214: RED colour. In normal operation, it is always ON. It indicates that the power supply +28V_USR is correct. If it is not lit, all the voltages referred to the user ground disappear.

D215: RED colour. In normal operation, it is always ON. It indicates that the power supply +15V_IGBT is correct. If it is not lit, there are not pulses in the IGBT's. There is some faulty component in the inverter circuit (IGBTs, GateDrive...).

D213: RED colour. In normal operation, it is always ON. It indicates that the power supply +24V_CONTROL is correct. If it is not lit, all the voltages referred to the analogue and digital ground disappear.

D230: RED colour. In normal operation, it is always ON. It indicates that the power supply +15V_TEMP is correct. If it is not lit, the temperature measurement faults.

LED 1, LED2 AND LED 3: GREEN colour. It is only lit one of them, and corresponds to the output phase (IGBT's) with higher temperature.

c) Indicator Leds of Control Board

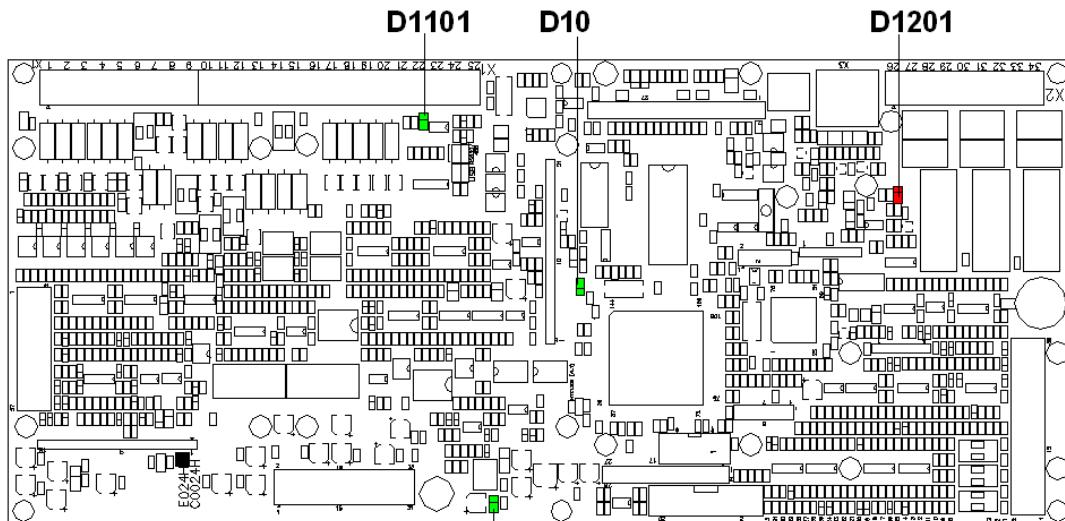


Figure 1.7. Leds of the Control Board

LED 10: GREEN colour. In normal operation, it is blinking. It indicates that the microprocessor is operating correctly.

LED 901: GREEN colour. In normal operation it is always ON. It indicates that the power supply for the DSP (3,3V) is correct.

LED 1101: GREEN colour. In normal operation, it is always OFF. It is lit if there is overheating in the integrated circuit for RS485 communications.

LED 1201: RED colour. In normal operation, it is always OFF. It is lit when the Hardware current limitation is performing.

d) Indicator Leds of Dc Bus Board

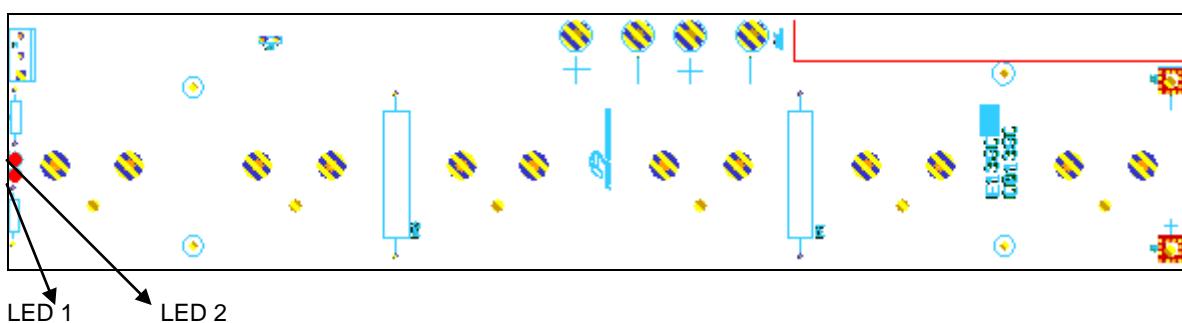


Figure 1.8. Leds of DC BUS

LED 1: RED colour. In normal operation it is always ON. It indicates that DC Bus is powered.

LED 2: RED colour. In normal operation, it is ON during the soft charge, and once the DC Bus is charge, the led becomes OFF.

e) Indicator Leds of Pluggable Pcb of Trigger Thyristors

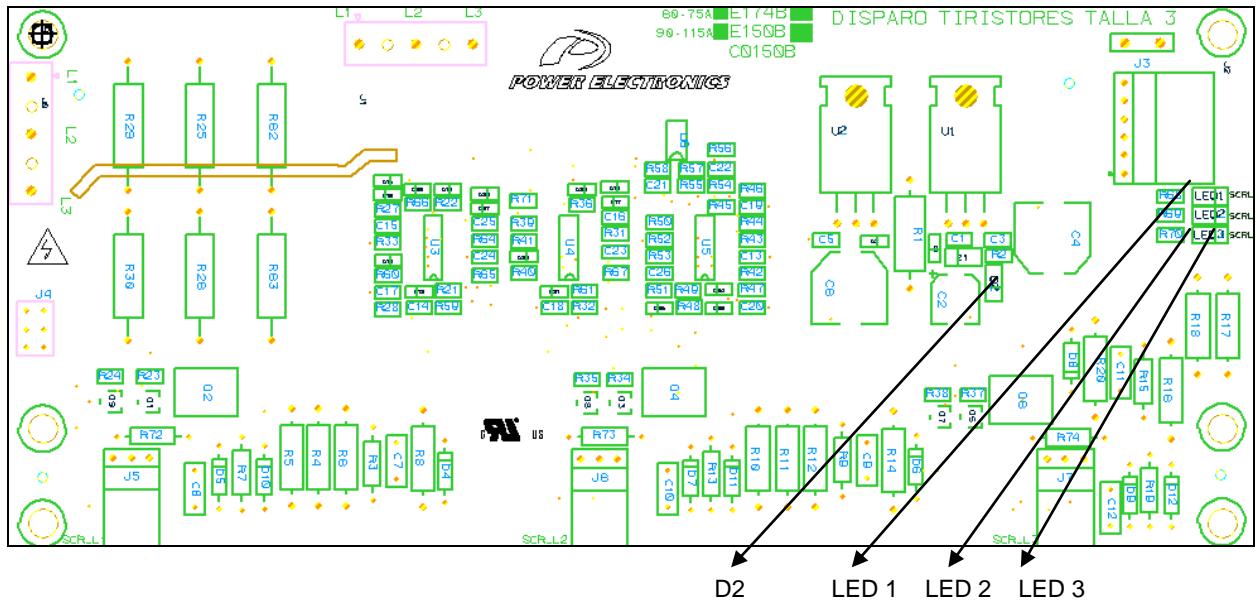


Figure 1.9. Leds of pluggable PCB of trigger thyristors

D2: RED colour. It reports us that the power supply for the triggering of the thyristors is correct (+5v_SCR).

LED 1, LED 2 AND LED 3: GREEN colour. They report us that the triggerings of the thyristors are being correctly performed.

f) Indicator Leds of the Upper Gate Drive Board

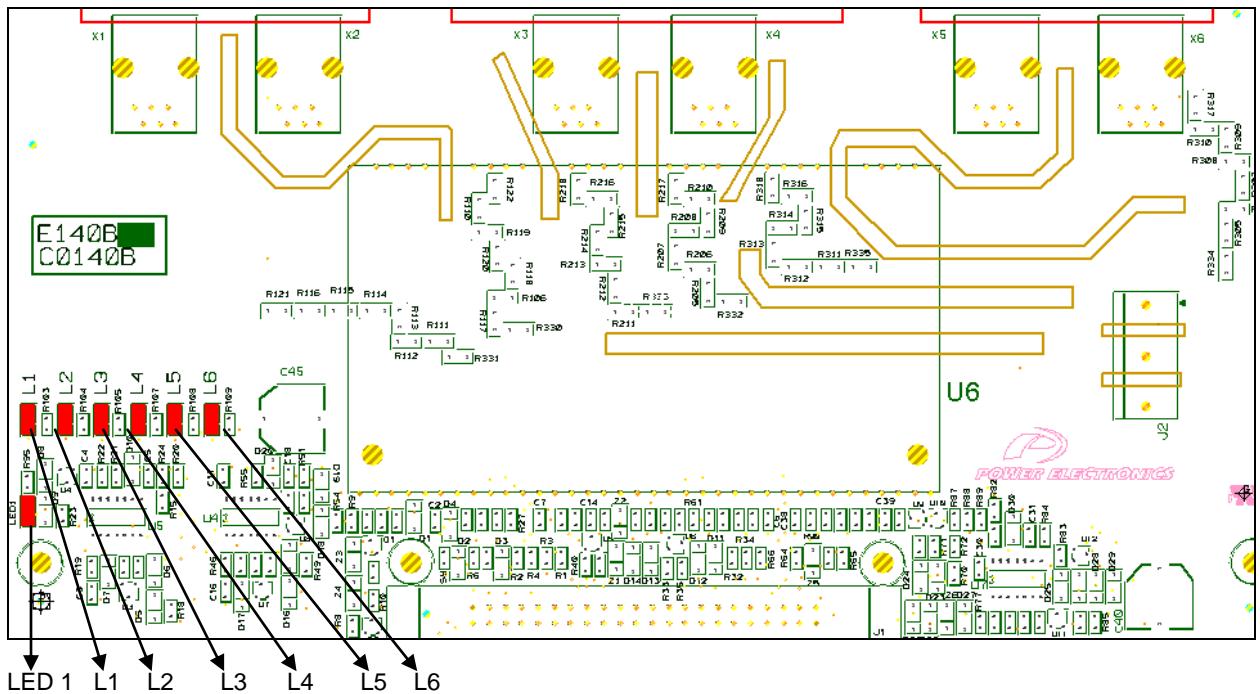


Figure 2.0. Upper gate drive board

LED 1: RED colour. In normal operation, it is always ON. It indicates +15V IGBT FUSE.

L1: GREEN colour. In normal operation, it is always ON. It indicates desaturation W +.

L2: GREEN colour. In normal operation, it is always ON. It indicates desaturation W -.

L3: GREEN colour. In normal operation, it is always ON. It indicates desaturation V +.

L4: GREEN colour. In normal operation, it is always ON. It indicates desaturation V -.

L5: GREEN colour. In normal operation, it is always ON. It indicates desaturation U +.

L6: GREEN colour. In normal operation, it is always ON. It indicates desaturation U -.

4.5.5 CB LED Indicators

The PCBs contains a certain number of LEDs, to indicate the status of the SD700, and they can notify if one element is wrong.

a) Power PCB

- **D114:** RED colour. In normal operation always ON. It shows that the DC Bus is charged. When it is off that means that the bus is completely discharged.
- **D507:** RED colour. In normal operation always OFF. It flickers when detects some hardware fault. These faults are:
 - o DC Bus High voltage
 - o DC Bus Low voltage
 - o Hight temperature in SD700
 - o Short circuit in Power PCB supply
- **D1000:** Green colour. In normal operation always OFF. It switches ON when the DC Bus discharge circuit is in operation.
- **D311:** RED colour. In normal operation always ON. It shows that +5V_SCR supply is OK. If it does not turn on, this is an indicative of problems in the pulse generation circuit for firing the thyristors.
-
- **D307:** RED colour. In normal operation always ON. It shows that +8V_USR supply is OK. If it does not turn on, this is an indicative of problems in the user supply (+5V_USR y +5V_COM).
-
- **D244:** RED colour. In normal operation always ON. It shows that +24V_DISP_COM supply is OK. If it does not turn on, there might be a failure in the communication between the Display and the Control Board.
- **D212:** RED colour. In normal operation always ON. It shows that +15V_SCR supply is OK.
- **D213:** RED colour. In normal operation always ON. It shows that +24V_CONTROL supply is OK. If it does not turn on, all the voltages referred to an analogical and digital mass disappear.
- **D214:** RED colour. In normal operation always ON. It shows that +28V_USR supply is OK. If it does not turn on, all the voltages referred to the user mass disappear
- **D215:** RED colour. In normal operation always ON. It shows that +15V_IGBT supply is OK. If it does not turn on, there are no pulses in the IGBT's. Any component of the inverter circuit is failing (IGBT's, GateDrive...)
- **D216:** RED colour. In normal operation always ON. It shows that +28V_DISP_PWR supply is OK. If it does not turn on, the Display is not being supplied.
- **D230:** RED colour. In normal operation always ON. It shows that +15V_TEMP supply is OK. If it does not turn on, the temperature measure circuit is failing.
- **D103:** RED colour. In normal operation always ON. It shows that Power PCB Bus is charged. If it does not turn on, the main power supply is not operating.
- **LED 1**
- **LED 2**
- **LED 3** } GREEN colour. In normal operation only one out of three is on. It shows the highest temperature of the three output phase (IGBTs)

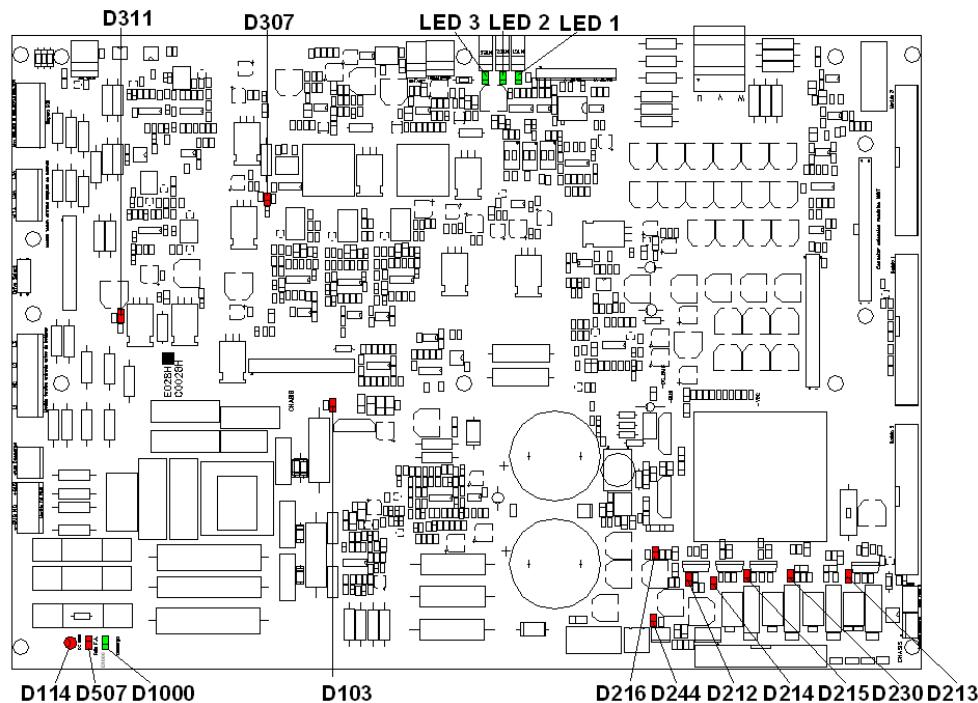


Figure 1.8. Power PCB Leds

b) Control PCB

- **LED 10:** GREEN colour. It FLICKERS during normal conditions. It shows that the processor is in normal operation.
 - **LED 901:** GREEN colour. During normal operation always OFF. It shows that DSP (3,3V) supply is OK.
 - **LED 1101:** GREEN colour. During normal operation always OFF. It switches ON when it detects an excessive temperature in 485 communications integrated circuit.
 - **LED 1201:** RED colour. During normal operation always OFF. It switches ON when the hardware current limit is on.

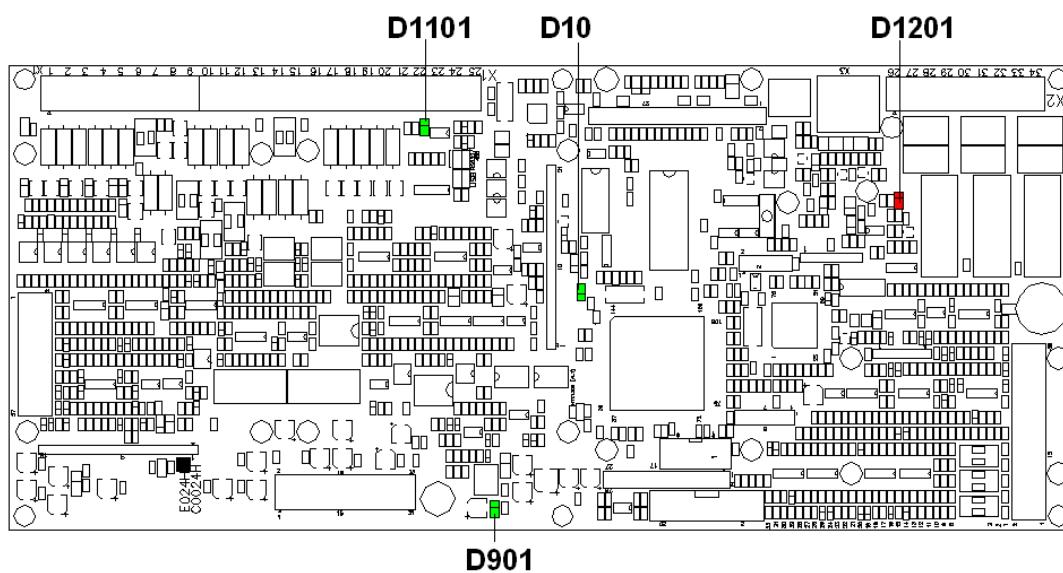


Figure 1.9. Control PCB LEDs

c) Upper Gate Drive (Upper Econodual Driver)

GREEN colour. In normal operation always ON. They switch OFF when they detect an IGBT failure.

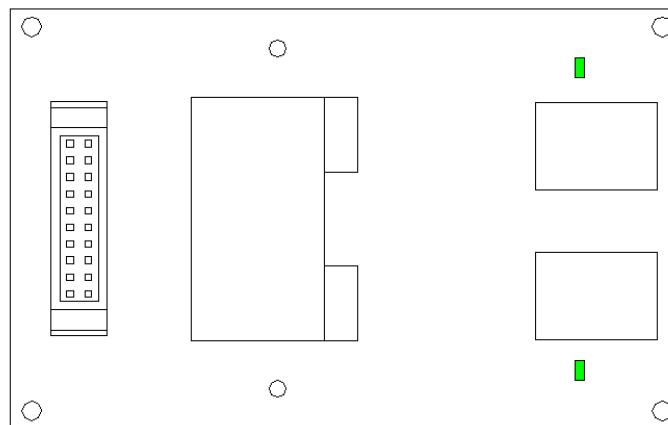
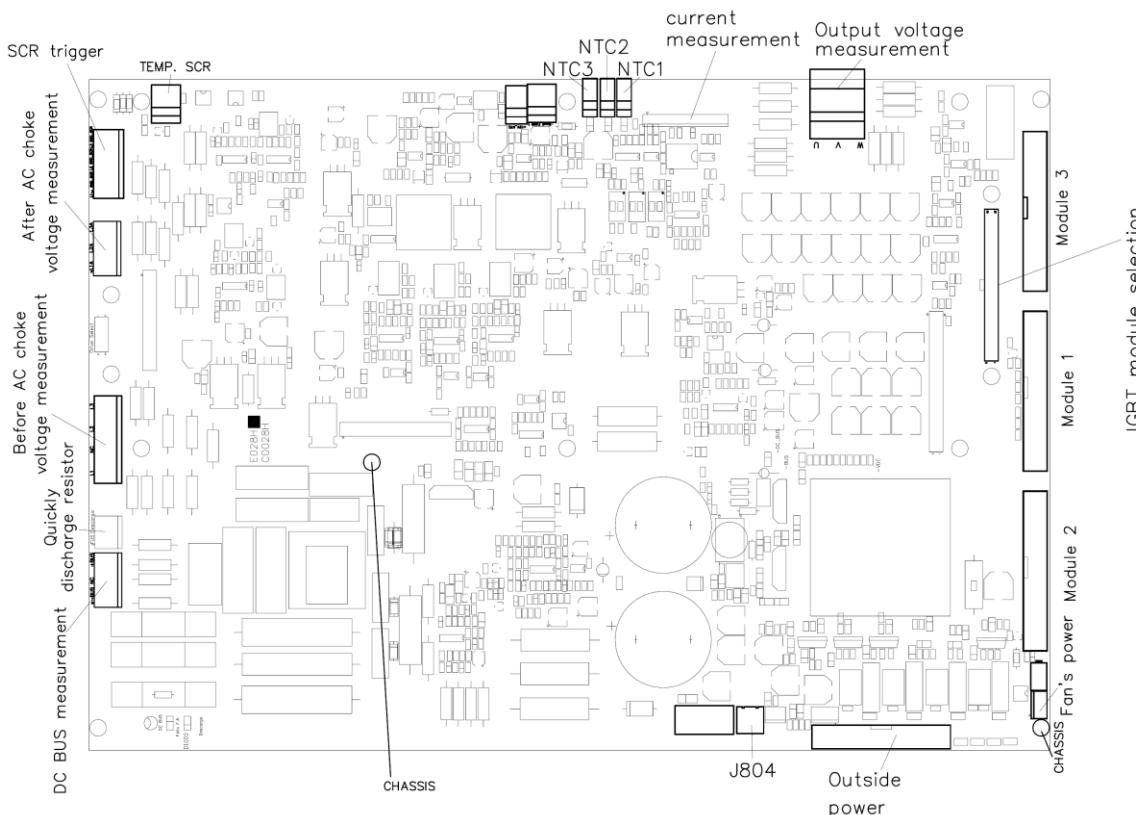


Figure 1.10. Upper Gate Drive LEDs.

If the LEDs of all the IGBTs switch OFF, that means that the Power PCB 4 fuses have blown

5. CONNECTIONS.

5.1 Power PCB



-DC BUS measure: it connects this pcb with one of the thyristors, where the voltage in the bus is measured

-Rapid discharged resistor: It connects this PCB with the Snubber, Trigger and Soft charge protection board.

- Measure of the input voltage before the AC chokes: It connects this PCB with the Snubber, Trigger and Soft charge protection board.

- Measure of the input voltage after the AC chokes: It connects this PCB with the Snubber, Trigger and Soft charge protection board.

- Trigger of the SCR: It connects this PCB with the Va Snubber, Trigger and Soft charge protection board.

- Temperature of the SCR: It connects this PCB with the heatsink of the thyristor and with the Fan power supply unit.

- NTC 1, NTC 2 , NTC 3: In frame frame 4 and 5, they connect this PCB with the IGBT's, while in other frames they connect this PCB with the NTC PCB (IGBT module selection)

- Current measure: It connects this PCB with the Current Transformers.

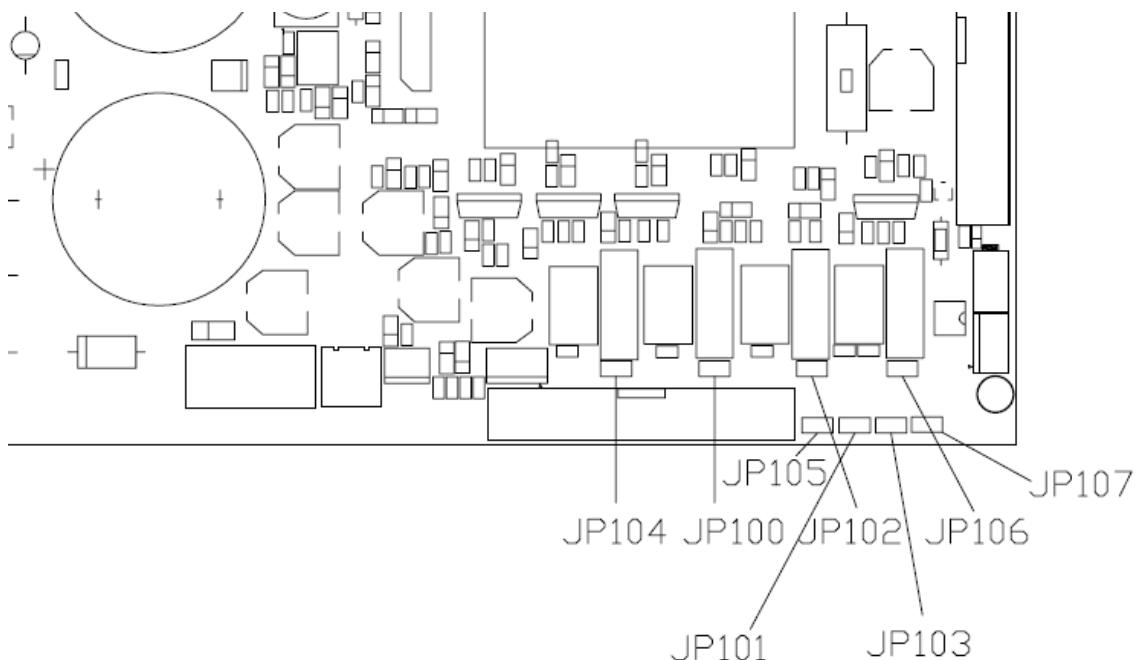
- Output voltage measure: It connects this PCB with the Output bars.

- **Connector IGBT modules selection:** It connects this PCB with the NTC PCB's (IGBT selection modules). If there is only one PCB in the device, the cable will come out from module 1. If there are two NTC PCB's, the cables will come out from modules 2 and 3. If there are three PCB, a cable will come out from any single module.

- **External supply:** This contactor allows an external supply of all devices, which are supplied from the Power PCB as well, when the drive is not operating. For instance, it will allow to visualize in the Display when the drive does not work.

- **J804:** this must be bridged, so that the IGBT's can receive trigger pulses.

- **JUMPERS:** By default only the even numbers are connected. In this case, the mass of the chassis are connecte in paralel with a capacitor, a resistor and a baristor.



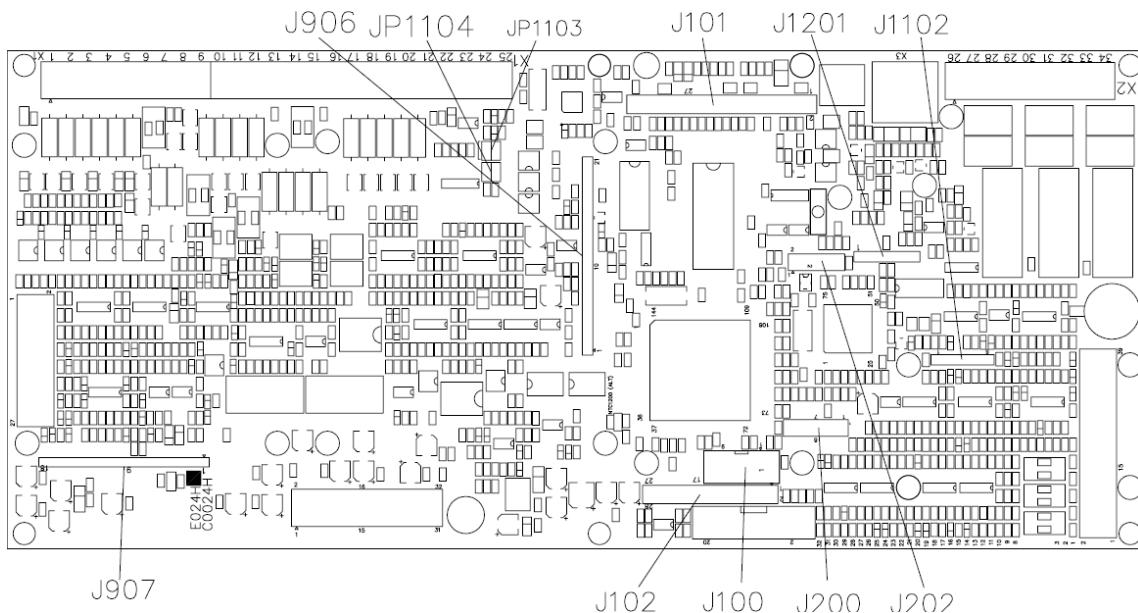
-**JP106:** It refers to the DGND, which corresponds to the analogical and digital masses.

-**JP200:** It refers to the GND_USR, which corresponds to the user mass.

-**JP104:** It refers to the GND_COM, , which corresponds to the Display mass supply.

If all the pairs of even and odd jumpers are connected, the masses are driven to the chassis and are not connected. This is used to solve field noises

5.2 Control Board



- **J907:** Connection of the Encoder Expansion PCB.
- **J101 and J102:** Connection of the Devicenet PCB.
- **J100:** Connector for programming the microprocessor BOOTSTRAP.
- **J202:** Connector for programming the DSP BOOTSTRAP
- **J200:** Programming of the DSP through the JTAG.
- **J1201:** Connection of the Dynamic Braking expansion PCB.
- **J906:** Connection of the Analogue and Digital inputs Expansion PCB.
- **J1102:** Connection of the Fiber Optics Expansion PCB.
- **JP1103:** Jumper for 232 and 485
- **JP1104:** Jumper for USB.

6. TESTING

6.1 Testing the rectifier and inverter.

Refer to figure 1.4 by using a multimeter, check the rectifier as the drawing indicates.

NOTE: each test is carried out 3 times (i.e. once per phase) which makes a total of 12 test.

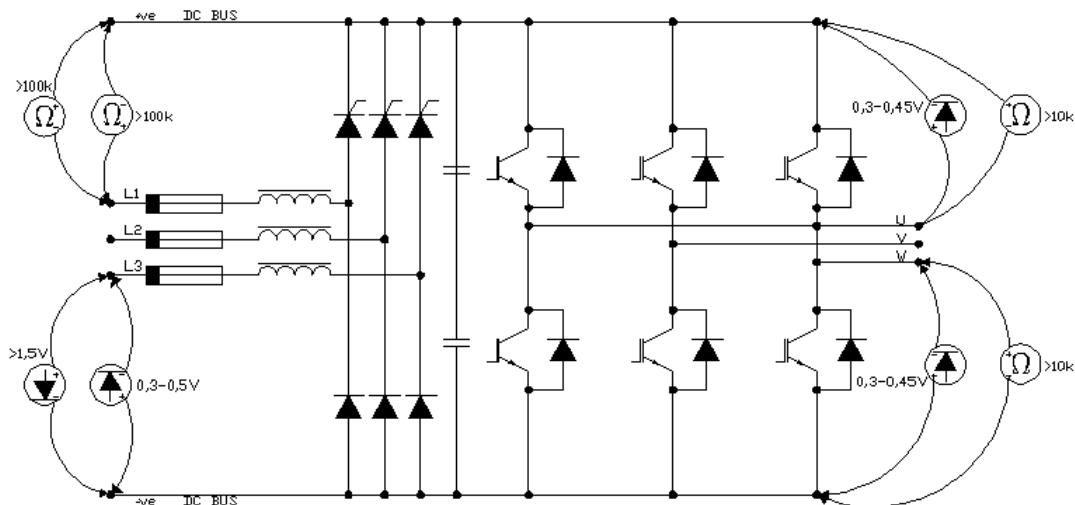


Figure 2.1. Rectifier and inverter testing

The components and the numbers per phase are shown below to assist in understanding what you are testing.

- 1) In order to test the rectifier components individually, remove the input fuses and test on the load side the fuses
- 2) In order to test the IGBTs individually requires the disassembly of the SD700.

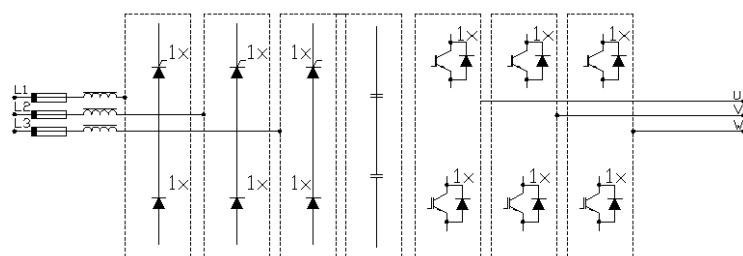


Figure 2.2 Frame 4

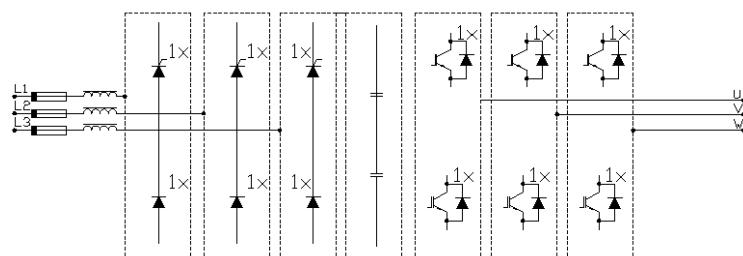
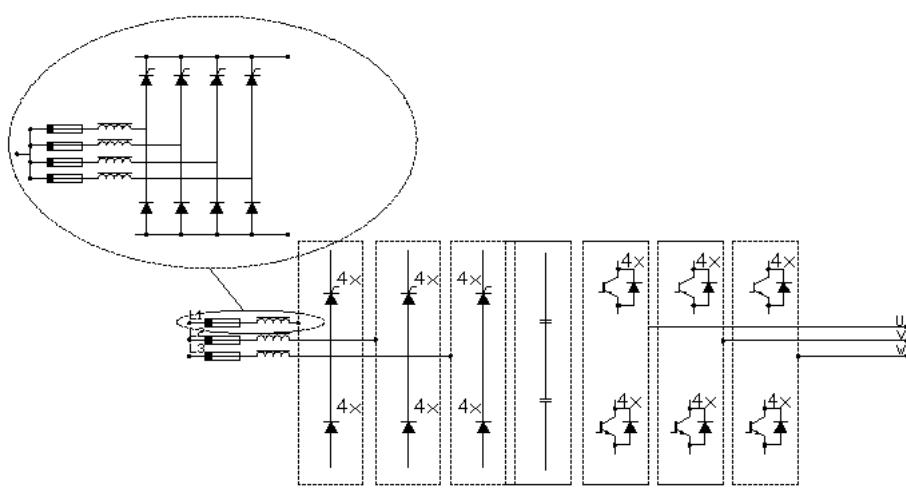
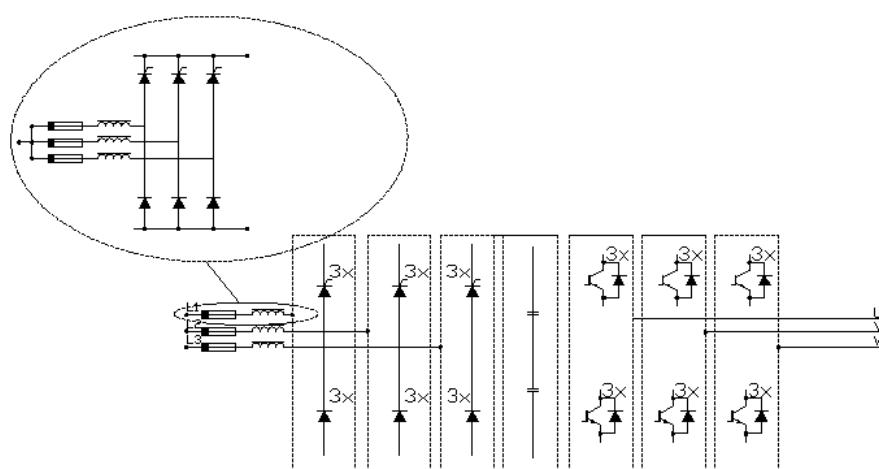
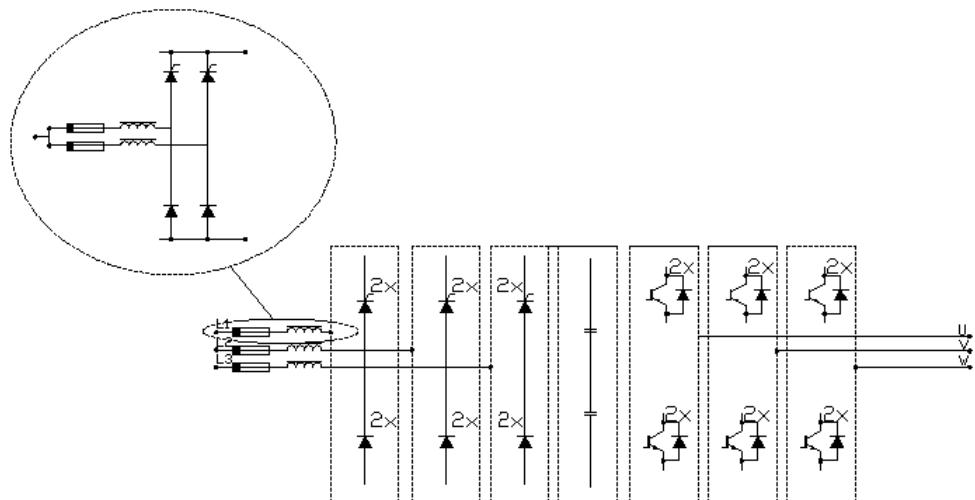


Figure 2.3 Frame 5



6.2 Individual SCR testing.

When the SD700 is disassembled, the SCR can be tested individually as it is shown in *figure 2.7*

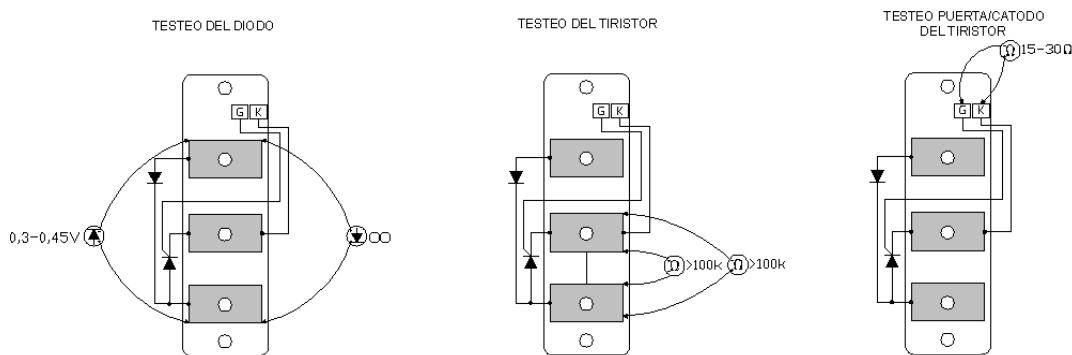


Figure 2.7. Individual SCR conduction test.

6.3 Testing the DC Bus Capacitor.

A general test without disassembling the SD700 is recommended. Use a multimeter set in mode OHMS to test the capacitors between HVDC terminals + and -. At first the resistance should offer a low value, but afterwards, as the resistance will increase as the it is supplied voltage from the battery of the multimeter (ensure the DC bus capacitors are fully discharged first). This charging period could take some time and it is better to ensure this procedure by testing a similar DC Bus capacitors in good conditions. It is necessary to apply the same load time to both DC Buses and then compare results. If there is a reasonable difference between both measurements, the replacement of the DC Bus will be necessary.

In order to test the capacitors individually, the DC Bus capacitors must have been disassembled from the SD700 and afterwards must be disassembled. Every capacitor must be measured with a multimeter and all of them must be discharged. The tester must be set in mode OHMS. Then the positive of the tester must be connected to the positive of the capacitor and repeat the operation with the negative. If the capacitor works properly, the resistance should start low and then increase as the capacitor is charged due to the voltage in the battery of the tester.

6.4 Individual IGBT test

In order to test an IGBT the use of a static grounding wrist strap and being earthed is necessary. When the SD700 is disassembled, the IGBTs can be tested individually as it is shown in *figure 2.8*.

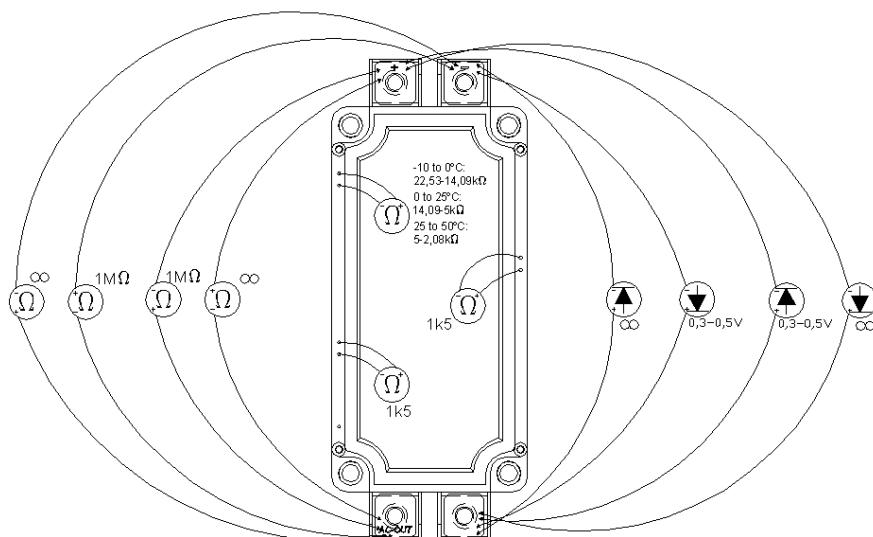


Figure 2.8. IGBT testing

6.5 Soft Powering After Repair.

Once all faulty components have been replaced and the SD700 has been duly reassembled, a SD700 softpowering test is highly recommended through the plug-in of an extgernal soft power supply unit called Variac. This power supply generates 600 V_{dc}. Connect the Variac to HVDC Bus terminals.

Then, when the Variac is on, it is necessary to increase voltage little by little and check that LEDS of the Power Supply and the leds of the upper gater drive turn on.

Connect the Display and verify that there are not faults and compare the voltage of "variac"

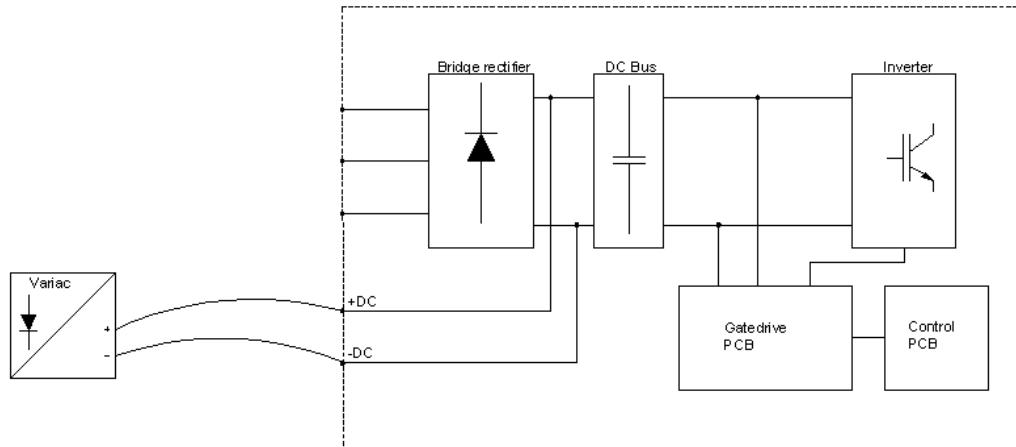


Figure 2.9. Soft Power Supply Connections

6.6 Checking external inputs

If the SD700 powers up correctly but fails to respond to external inputs, the following procedures will enable these inputs to be checked.

Before checking the external inputs, we must configure the SD700 in local mode (Screen 'G4.1 CNTROL MODE1').

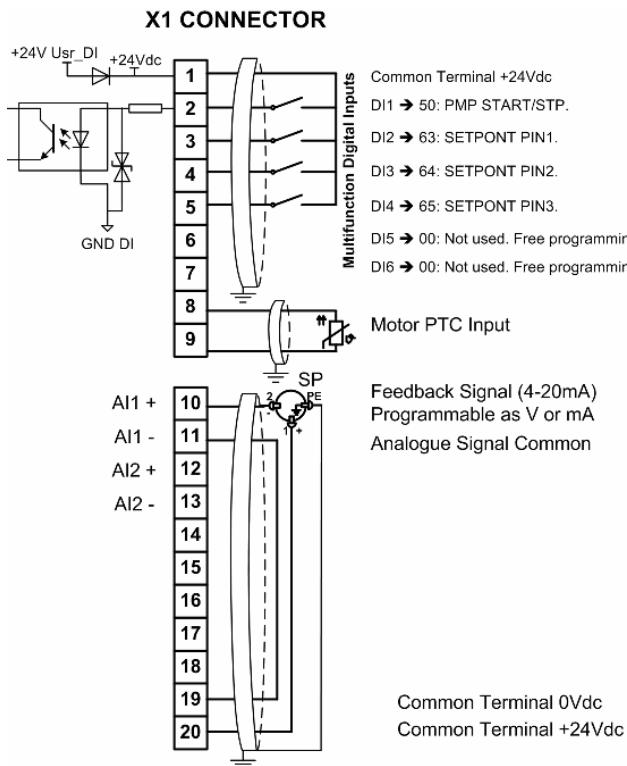


Figure 2.10 External inputs

6.6.1 Check the analogue inputs

Analogue input 1

Jumper input 19 with input 11, and input 18 with input 10. In the screen SV.3 'ANLG IN1' or SV.3 'AIN1 Refr', the value of the analogue input 1 has to be the highest one allowed.

Analogue input 2

Jumper input 19 with input 13, and input 18 with input 12. In the screen SV.3 'ANLG IN2' or SV.3 'AIN2 Refr', the value of the analogue input 2 has to be the highest one allowed

6.6.2 Check digital inputs

The screen SV.3 'Input DG' shows whether the Digital Inputs are activated or not, from DI1 to DI6 as it is shown in *figure 2.11 y 2.12*. A "X" is Active ,and "O" is not active

- Jumper terminal 1 with terminal 2, and verify that the digital input 1 is connected:

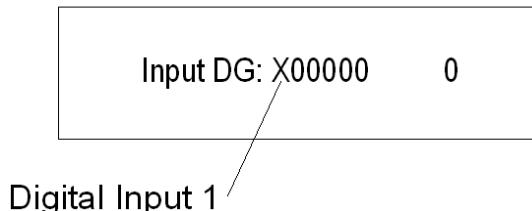


Figure 2.11 Digital Input 1 active

- Jumper terminal 1 with terminal 3, and verify that the digital input 1 is connected:

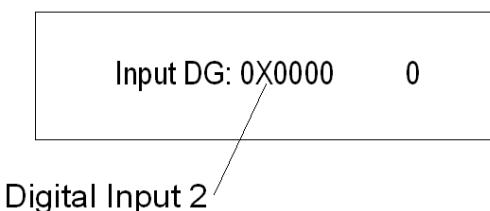


Figure 2.12 Digital Input 2 active

Verify that all inputs are right.

7. SUBASSEMBLY REPLACEMENT

Make sure the SD700 is safe to work, see section 3 before proceeding.

7.1. SD700 FRAME 1.

7.1.1. ACCESS TO THE INSIDE OF THE DRIVE.

Disassembly of the embellishers

In order to repair or replace any component of the drive, you should access to the inside of it.

See figure 7.1.1 and figure 7.1.2 while reading the following instructions:

- 1) Remove the drive's door by unscrewing the 4 **M4x8 DIN-7895H** screws which fix it to the chassis.
- 2) Disconnect the Display. For this, disconnect ethernet cable which joins the display and the drive. Push the tab of the RJ45 connector and pull it up.
- 3) Disconnect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).

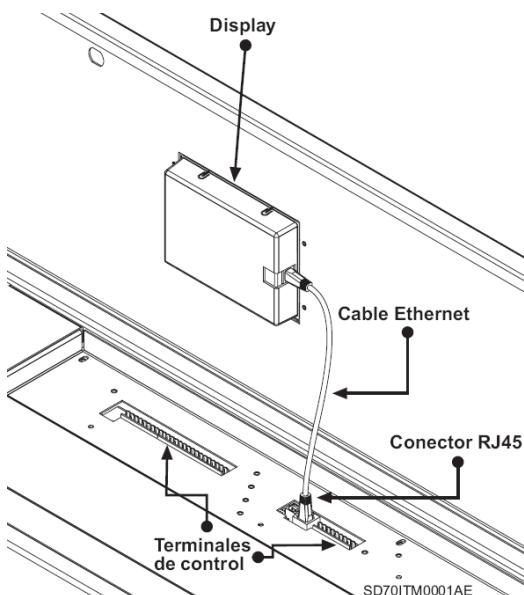


Figure 3.1 Display connection and control terminals

- 4) Remove the 3 Phillips **M4x8 DIN-7895H** screws, with their corresponding washers and lock washers, which join the embellisher and the chassis (See figure 7.1.1 a)



Figure 7.1.1 a

- 5) Disconnect the power supply cables of the fans in the embellishers.
- 6) Remove the embellishers.



Figure 7.1.2 Access to the inside of the drive

Assembly of the embellishers

- 1) Place the embellishers on the supports of the drive's sides as the figure 7.1.1a shows.

- 2) Screw the embellishers to the supports of the sides with 3 Phillips **M4x8 DIN-7895H** screws.
- 3) Connect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).
- 4) Connect the Display by means of the ethernet cable which goes from the display to the drive.

7.1.2. DOOR

Disassembly of the door

See the figure 7.1.3 while following the next instructions:

- 1) Remove the door by unscrewing 4 Phillips **M4x8 DIN-7895H** screws.
- 2) Disconnect the ethernet cable from the display.
- 3) Remove the display from the support of the door.
- 4) Remove the door.



Figure 7.1.3 Remove the door

Assembly of the door

- 1) Put the display on the support of the door.
- 2) Connect the ethernet cable of the display.
- 3) Approach the door and fix it with the 4 Phillips **M4x8 DIN-7895H** screws.

7.1.3. UPPER AND LOWER COVERS.

Disassembly of the upper and lower covers

- 1) Unscrew the 8 Phillips **M4x8** DIN-7895H screws that join the upper covers and the drive chassis (see figure 7.1.4).
- 2) Unscrew the 8 Phillips **M4x8** DIN-7895H screws which join the lower covers and the drive chassis (see figure 7.1.5)
- 3) Remove the upper and lower covers.



Figura 7.1.4



Figura 7.1.5

7.1.4. CONTROL BOARD

Disassembly of the control board

The use of a static grounding wrist strap and being earthed is highly required to repair the unit.

See the figure 7.1.6 while reading the following instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control board and the plastic hexagonal spacers **M3x20**.
- 2) Remove the control board by pulling it up, until disconnecting the female connectors of 40, 32 and 28 pins of the control board, from the male connectors of the power board where control board is connected.
- 3) Once the control board is removed, put this board into a static proof bag for a safekeeping.

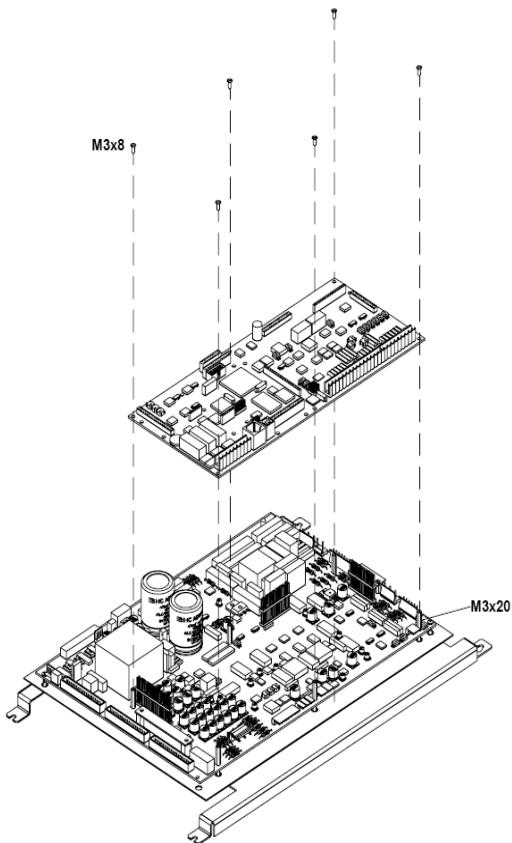


Figure 7.1.6 Remove the control board

Assembly of the control board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the control board, avoid an excessive handling of the board.
- 3) Pick the new control board from the static proof bag.
- 4) Put the new control board in the same place than the replaced one, matching the board holes with the hexagonal plastic spacers **M3x20** (see figure 7.1.6).
- 5) Match the male connector of 40, 32 and 28 pins of the control board with the corresponding female connector of the power board and slightly push the control board down to connect the pins.
- 6) Once the board is properly placed, screw the 6 plastic screws **M3x8 DIN-933** in the corresponding hexagonal plastic spacers **M3x20**.

7.1.5. POWER BOARD**Disassembly of the Power Board**

Before proceeding, the control board must have been disassembled (see section 7.1.4).

See the figure 7.1.7 while reading the following instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect all the wires which are connected to this board.

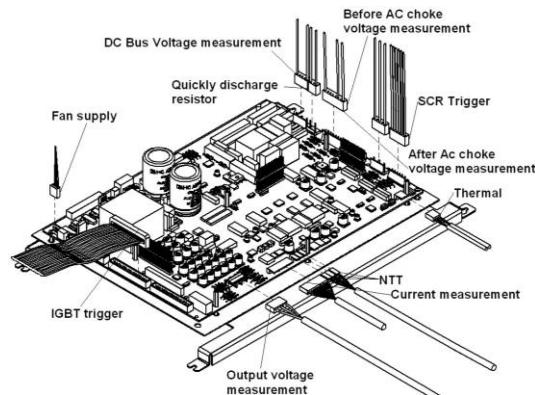


Figure 7.1.7. Disconnect all connected wires from power board

- 3) Remove the 6 hexagonal plastic spacers **M3x20**, which are joined to the electronic tray, and support the control board.
- 4) Unscrew the 5 Phillips screws **M3x8 DIN-7895H**.
- 5) Remove the power board of the drive.

Assembly of the power board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the power board, avoid an excessive handling of the board.
- 3) Pick the new power board from the static proof bag.
- 4) Put the new power board in the same place than the replaced one.
- 5) Put the board on the electronic tray, matching the bolts of the tray with the holes of the board (see figure 7.1.8).

- 6) Once the board is properly placed, screw the 5 Phillips screws **M3x8** DIN-7895H in the bolts of the electronic tray.
- 7) Connect the cables to the corresponding connectors (see figure 7.1.7).
- 8) Put the hexagonal plastic spacers **M3x20**, screwing them in their corresponding bolts of the electronic tray, in order to place the control board later.

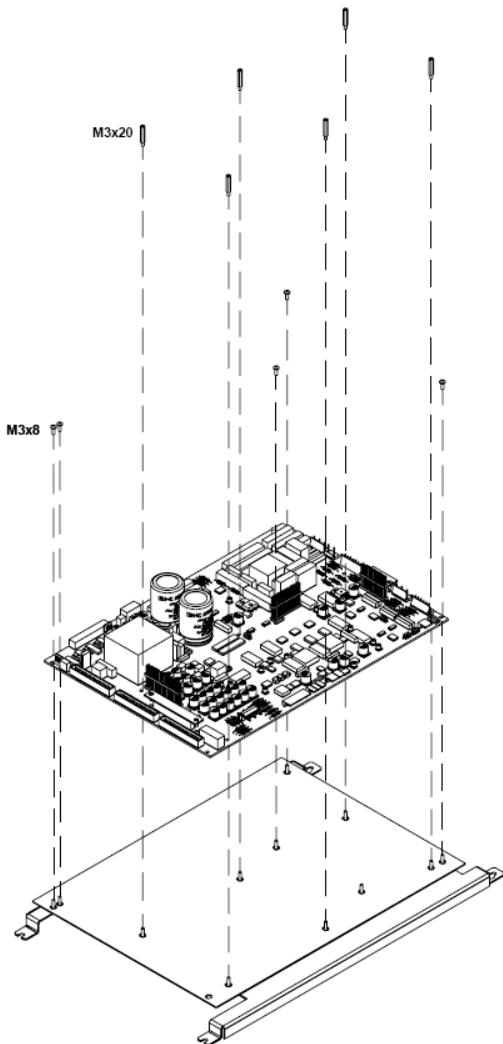


Figure 7.1.8. Disassembly of the power board

7.1.6. DRIVE SELECT BOARD

Disassembly of the Drive Select board

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this board and the plastic hexagonal spacers **M3x12**.

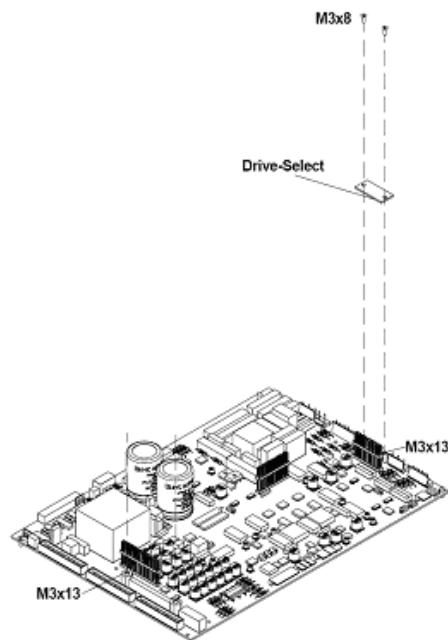


Figure 3.8a. Disassembly of the Drive Select board

Assembly of the Drive Select board

Put the drive select board on the 2 plastic hexagonal spacers **M3x13** and join them with 2 plastic screws **M3x8** DIN-933.

7.1.7. GATE DRIVE BOARD

Disassembly of Gate Drive board

Before removing the gate drive board, it is necessary to remove the embellishers and the tray where control and power boards are inserted (see sections 7.1.1 – 7.1.4 – 7.1.15).

See figure 7.1.9:

- 2) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 3) Disconnect the braking cable, the bus cable, and the cable for connections of the gate drive board.



Figure 7.1.9. Disassembly of the gate drive board

- 4) Unscrew the 3 Phillips screws **M3x6 DIN-7895H**.
- 5) Remove the board.

Assembly of Gate Drive board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the gate drive board, avoid an excessive handling of the board.
- 3) Pick the new gate drive board from the static proof bag.
- 4) Put the board in the correct position as the figure 7.1.9 shows, matching the holes.
- 5) Insert the 3 Phillips screws **M3x6 DIN-7895H**.
- 6) Connect the braking cable, the bus cable and the cable for connections of the gate drive board.

7.1.8. DC BUS

Disassembly of the DC Bus

Before proceeding, it is necessary to remove the embellishers (see section 7.1.1), the tray where control and power boards are inserted (see figure 7.1.7), the gate drive board (see section 7.1.7), the connections board (see section 7.1.9).

- 1) Unscrew the 7 screws **M3x6 DIN-7895H**, which fix the bus board to the chassis (see figure 7.1.10)
- 2) Remove the 4 nuts **M5** which fix the connections of the choke to the bus (see figure 7.1.1).
- 3) Remove the DC bus.



Figure 7.1.10



Figure 7.1.11

Assembly of the DC Bus

- 1) Put the bus matching the holes.
- 2) Screw the 7 Phillips screws **M3x6 DIN-7895H** that join the bus and the chassis.
- 3) Insert the 4 nuts **M5** that join the choke and the bus board.

7.1.9. POWER CONNECTIONS BOARD

Disassembly of the power connections board

Before removing the power connections board, you should remove the embellishers (see section 7.1.1), the tray where the control and power boards are inserted (see figure 7.1.7) and the gate drive board (see section 7.1.17).

- 1) Disconnect the cables of the dV/dt coils, motor voltage measurement, cable for soft-load relay, cable for coil relay and NTC cable.
- 2) Remove the 2 screws of IGBT **M5X16 DIN-7895H** (see figure 7.1.12).



Figure 7.1.12

- 3) Remove the 6 screws **M3X6** (see figure 7.1.13)

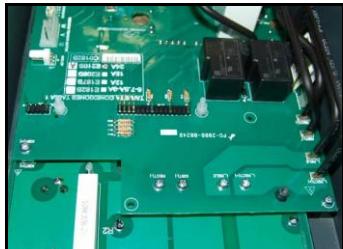


Figure 7.1.13

- 4) Remove the board.

Assembly of the power connections board

- 1) Spread the heatsink area where the IGBT is going to be placed with new thermal paste.
- 2) Put the board in the proper position (see figure 7.1.13)
- 3) Screw the 2 IGBT screws **M5X16 DIN-7895H**, with a tightening pressure of **5N/m**.
- 4) Screw the 6 screws **M3x6** that join the board and the chassis.
- 5) Connect all cables before described.

7.1.10. SINGLE-PHASE CHOKE

Disassembly of the single-phase choke

In order to remove the single-phase choke, you should remove the embellishers (see section 7.1.1) and the tray for the boards (see figure 7.1.7) before.

- 1) Unscrew the 4 screws M5X10 which join the bottom of the chassis and the top. See figure 7.1.14.



Figure 7.1.14

- 2) Before separating the two chassis completely, disconnect the fan cable (see figure 7.1.15).



Figure 7.1.15

- 3) Remove the top of the chassis and put it face down (see figure 7.1.18).

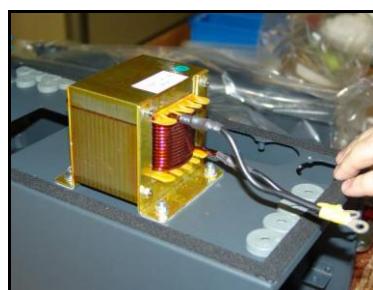


Figure 7.1.18

- 4) Disconnect the cables of the single-phase choke, by removing the screws M5X10 which joins them and the spacers (see figure 7.1.19).



Figure 7.1.19

- 5) Remove the 4 nuts M5 which fix the choke to the chassis.
- 6) Remove the choke.

Assembly of the single-phase choke

- 1) Fix the new single-phase choke to the chassis by using the nuts **M5**.
- 2) Connect the cables of the choke to the spacers (see figure 7.1.19).
- 3) Connect the cable for the fans.
- 4) Assembly again the top of the chassis with the bottom by means of the 4 screws **M5X10 DIN-7895H**.

7.1.11. DV/DT CHOKES

Disassembly of the dV/dt chokes

It is necessary to remove the embellishers (see section 7.1.1), the tray for the boards (see figure 7.1.7) and separate the top of the chassis from the bottom (follow the steps described in section 7.1.9 and 7.1.10)

- 1) Remove the 4 nuts **M4** which fix dV/dt chokes to the chassis (see figure 7.1.20).



Figure 7.1.20

- 2) Disconnect all cables of the dV/dt choke from the connections board.
- 3) Remove dV/dt chokes.

Assembly of the dV/dt chokes

- 1) Fix the new dV/dt chokes to the chassis by means of their nuts **M4**.
- 2) Put the cables of the new dV/dt choke through the holes of the chassis (see figure 7.1.21).



Figure 7.1.21

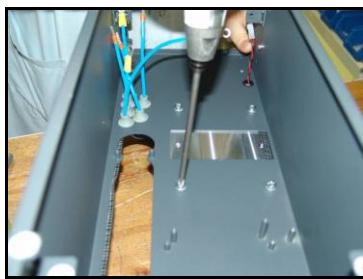
- 3) Assembly again the top of the chassis with the bottom by means of the 4 screws **M5X10 DIN-7895H**.

7.1.12. HEATSINK

Disassembly of the heatsink

In order to remove de heatsink, first, you should remove the embellishers (see section 7.1.1), the tray for the boards (see figure 7.1.7), the gate drive board (see section 7.1.7), the DC bus (see section 7.1.8) and the power connections board (see section 7.1.9), and separate the top of the chassis from the bottom (follow the steps of sections 7.1.9 and 7.1.10).

- 1) Remove the 4 screws **M5X10** which fix the heatsink to the chassis of the drive (see figure 7.1.22).



See figure 7.1.22

- 2) Remove the heatsink.

Assembly of the heatsink

- 1) Fix the new heatsink to the chassis by using 4 screws **M5x10**, with a tightening pressure of **3N/m**.
- 2) Join the top and the bottom of the chassis.
- 3) Spread the heatsink area where the IGBT of the power connections board is going to be placed, with thermal-conductor paste.
- 4) Fix the DC bus (see section 7.1.8)
- 5) Fix the power connections board (see section 7.1.19).
- 6) Fix the gate drive board (see section 7.1.7).

1.1.13 FANS

Disassembly of the heatsink fan

- 1) Remove the lower cover (see section 7.1.3).
- 2) Disconnect the power supply cable.
- 3) Remove the 2 screws **M4x45 DIN-84** that fix the fan to the structure (see figure 7.1.23).
- 4) Remove the fan.



Figura 7.1.23

Assembly of the heatsink fan

- 1) Put the new fan and fix it with the screws.
- 2) Connect the power supply cable.
- 3) Fix the cover.

7.2. SD700 FRAME 2.

7.2.1. ACCESS TO THE INSIDE OF THE DRIVE.

Disassembly of the embellishers

In order to repair or replace any component of the drive, you should access to the inside of it.

See figure 7.2.1 and figure 7.2.2 while reading the following instructions:

- 1) Remove the drive's door by unscrewing the 4 **M4x8 DIN-7895H** screws which fix it to the chassis.
- 2) Disconnect the Display. For this, disconnect ethernet cable which joins the display and the drive. Push the tab of the RJ45 connector and pull it up.
- 3) Disconnect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).

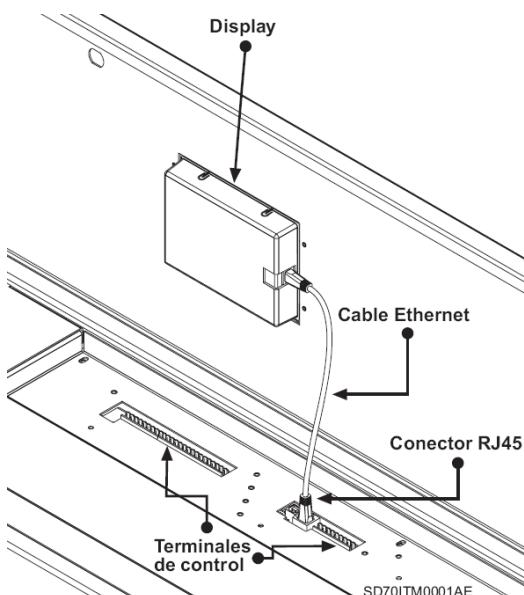


Figure 3.1 Display connection and control terminals

- 4) Remove the 4 Phillips **M4x8 DIN-7895H** screws, with their corresponding washers and lock washers, which join the lateral internal cover and the chassis (See figure 7.2.1 a).



Figure 7.2.1 a

- 5) In case of IP54 model of SD700 drives, disconnect the power supply of the fans that are in the embellishers.
- 6) Remove the support of the cover of the control board with the 2 screws **M4x8 DIN-7895H** (see figure 7.2.1 b)



Figure 7.2.1 b

- 7) Remove the embellishers.
- 8) Remove the plastic protector for the power connections.



Figure 7.2.2 Access to the inside of the drive

Assembly of the embellishers

- 1) Place the embellishers on the supports of the drive's sides as the figures 7.2.1a and 7.2.1b show.
- 2) Screw the embellishers to the supports of the sides with 6 Phillips **M4x8 DIN-7895H** screws.
- 3) Put the plastic protector for the power connections on the sides of the drive.
- 4) Connect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).
- 5) Connect the Display by means of the ethernet cable which goes from the display to the drive.

7.2.2. DOOR**Disassembly the door**

See the figure 7.2.3 while following the next instructions:

- 1) Remove the door by unscrewing 4 Phillips **M4x8 DIN-7895H** screws.
- 2) Disconnect the ethernet cable from the display.
- 3) Remove the display from the support of the door.
- 4) Remove the door.



Figure 7.2.3 Remove the door

Assembly of the door

- 1) Put the display on the support of the door.
- 2) Connect the ethernet cable of the display.
- 3) Approach the door and fix it with the 4 Phillips **M4x8 DIN-7895H** screws.

7.2.3. UPPER AND LOWER COVERS.

Disassembly of the upper covers and the lower covers

See the figure 7.2.4 while following the next instructions:

- 1) Unscrew the 10 Phillips **M4x8** DIN-7895H screws that join the upper covers and the drive chassis.
- 2) In IP20 models, remove the upper cover slowly until disconnecting the power supply cable of the fans. Once disconnected the cable, remove the cover completely.
- 3) Unscrew the 8 Phillips **M4x8** DIN-7895H screws which join the lower covers and the drive chassis.
- 4) Remove the upper and lower covers.



Figure 7.2.4 Remove the covers.

Assembly of the upper covers and the and lower covers

- 1) Put the lower covers as the figure 3.4 shows.
- 2) Fix the covers to the chassis of the drive by using the 8 Phillips screws **M4x8** DIN-7895H that join the lower covers and the chassis.
- 3) Move the upper covers closer to the chassis of the drive, and connect the power supply cable of the fans.
- 4) Screw the upper covers to the drive chassis by using the 10 Phillips screws **M4x8** DIN-7895H.

7.2.4. CONTROL BOARD

Disassembly of the control board

The use of a static grounding wrist strap and being earthed is highly required to repair the unit.

See the figure 7.2.5 while reading the following instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control board and the plastic hexagonal spacers **M3x20**.
- 2) Remove the control board by pulling it up, until disconnecting the female connectors of 40, 32 and 28 pins of the control board, from the male connectors of the power board where control board is connected.
- 3) Once the control board is removed, put this board into a static proof bag for a safekeeping.

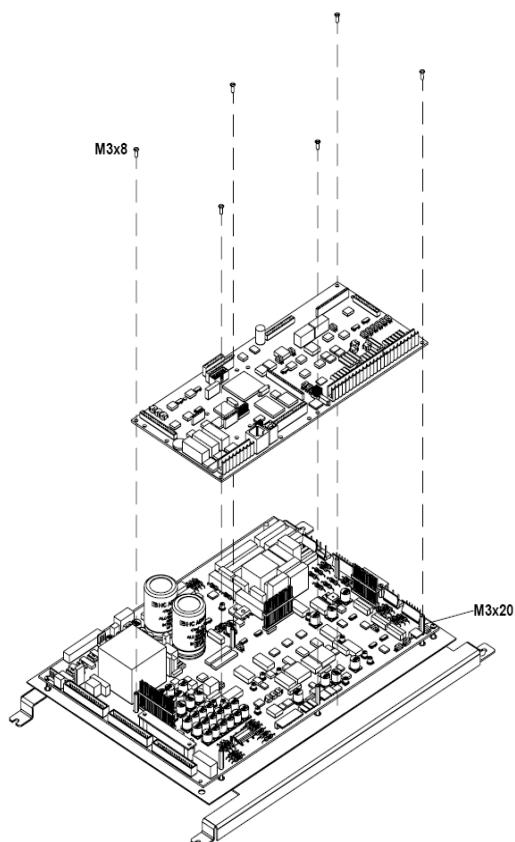


Figure 7.2.5 Remove the control board

Assembly of the control board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the control board, avoid an excessive handling of the board.
- 3) Pick the new control board from the static proof bag.
- 4) Put the new control board in the same place than the replaced one, matching the board holes with the hexagonal plastic spacers **M3x20** (see figure 7.2.6).
- 5) Match the male connector of 40, 32 and 28 pins of the control board with the corresponding female connector of the power board and slightly push the control board down to connect the pins.
- 6) Once the board is properly placed, screw the 6 plastic screws **M3x8 DIN-933** in the corresponding hexagonal plastic spacers **M3x20**.

7.2.5. POWER BOARD**Disassembly of the power board**

Before proceeding, the control board must have been disassembled (see section 7.2.4).

See the figure 7.2.6 while reading the following instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect all the wires which are connected to this board.

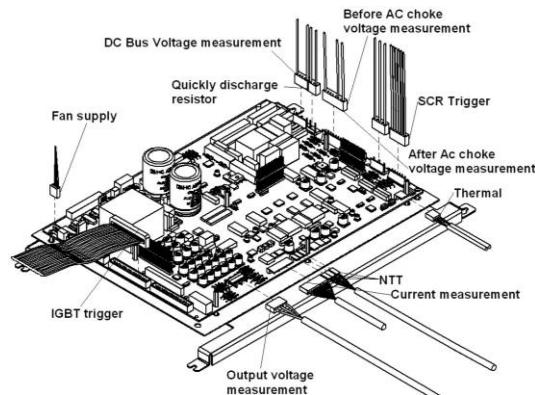


Figure 7.2.6. Disconnect all connected wires from power board

- 3) Remove the 6 hexagonal plastic spacers **M3x20**, which are joined to the electronic tray, and support the control board.
- 4) Unscrew the 5 Phillips screws **M3x8 DIN-7895H**.
- 5) Remove the power board of the drive.

Assembly of the power board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the power board, avoid an excessive handling of the board.
- 3) Pick the new power board from the static proof bag.
- 4) Put the new power board in the same place than the replaced one.
- 5) Put the board on the electronic tray, matching the bolts of the tray with the holes of the board (see figure 7.2.7)

- 6) Once the board is properly placed, screw the 5 Phillips screws **M3x8** DIN-7895H in the bolts of the electronic tray.
- 7) Connect the cables to the corresponding connectors (see figure 7.2.6).
- 8) Put the hexagonal plastic spacers **M3x20**, screwing them in their corresponding bolts of the electronic tray, in order to place the control board later.

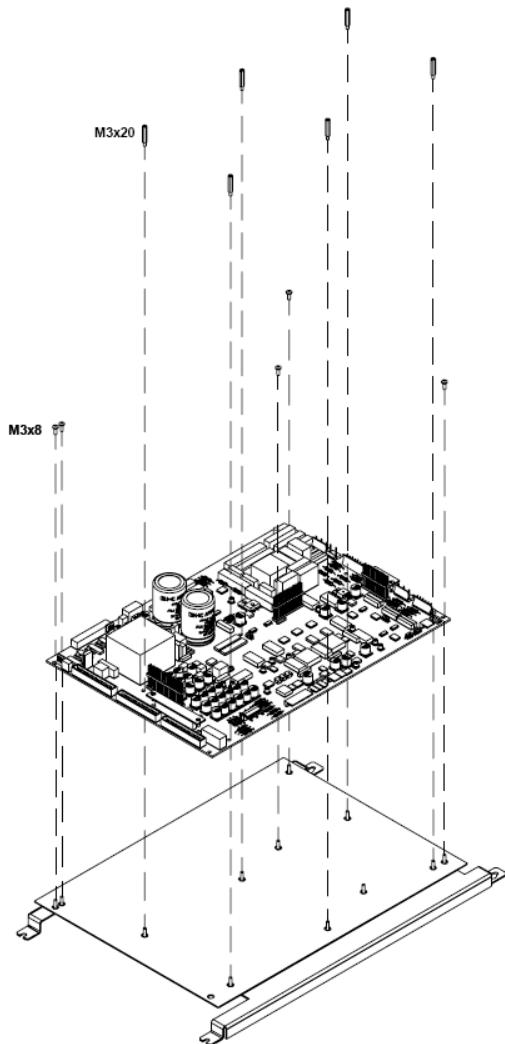


Figure 7.2.7. Disassembly of the power board

7.2.6. DRIVE SELECT BOARD

Disassembly of the Drive Select board

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this board and the plastic hexagonal spacers **M3x12**.

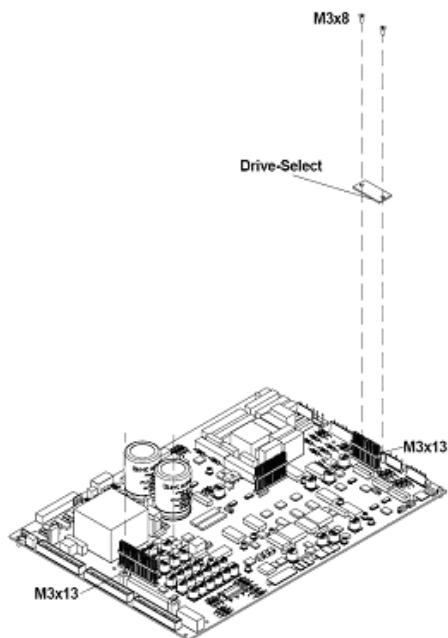


Figure 7.2.8. Disassembly of the Drive Select board

Assembly of the Drive Select board

Put the drive select board on the 2 plastic hexagonal spacers **M3x13** and join them with 2 plastic screws **M3x8** DIN-933.

7.2.7. GATE DRIVE BOARD

Disassembly of the Gate Drive board

Before removing the gate drive board, it is necessary to remove the embellishers and the tray where control and power boards are inserted (see sections 7.2.1 – 7.2.4 – 7.2.15).

See figure 7.2.9:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the braking cable, the bus cable, and the cable for connections of the gate drive board.



Figure 7.2.9. Disassembly of the gate drive board

- 3) Unscrew the 4 Phillips screws **M3x8 DIN-7895H**.
- 4) Remove the board.

Assembly of the Gate Drive board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the gate drive board, avoid an excessive handling of the board.
- 3) Pick the new gate drive board from the static proof bag.
- 4) Put the board in the correct position as the figure 7.2.9 shows, matching the holes.
- 5) Insert the 4 Phillips screws **M3x8 DIN-7895H**.
- 6) Connect the braking cable, the bus cable and the cable for connections of the gate drive board.

7.2.8. DC BUS

Disassembly of DC Bus

Before proceeding, it is necessary to remove the embellishers (see section 7.2.1) and the tray where the control and power board are inserted (see figure 7.2.7).

- 1) Unscrew the 2 screws (**M5X10 DIN-7895H**), which fix the bus board with the power connections board.
- 2) Unscrew the 3 Phillips screws **M3x8 DIN-7895H** which join the bus and the chassis. See figure 7.2.12.
- 3) Remove the DC bus.



Figure 7.2.12. Disassembly of DC Bus

Assembly of DC Bus

- 1) Put the bus matching the holes.
- 2) Screw the 3 Phillips screws **M3x8 DIN-7895H** which join the bus and the chassis.
- 3) Screw the 2 screws (**M5X10 DIN-7895H**) which join the connections board with the DC Bus.

7.2.9. POWER CONNECTIONS BOARD

Disassembly of the power connections board

Before removing the power connections board, you should remove the embellishers (see section 7.2.1), the tray where the control and power boards are inserted (see figure 7.2.7), the DC Bus (see section 7.2.9) and the gate drive board (see section 7.2.7).

- 1) Disconnect the NTC cable.
- 2) Remove the 4 screws of IGBT **M5X16 DIN-7895H** (see figure 7.2.13).
- 3) Remove the 6 nuts **M5** that join the fan structure and the connections board (see figure 7.2.14).
- 4) Remove the Phillips screw **M3x8 DIN-7895H** of the chassis.
- 5) Remove the 2 plastic screws **M3x8 DIN-933**.
- 6) Remove *the board*.



Figure 7.2.13. Disassembly of the power connections board



Figure 7.2.14

Assembly of the power connections board

- 1) Spread the heatsink area where the IGBT is going to be placed with new thermal paste.
- 2) Put the board in the proper position (see figure 7.2.13).

- 3) Screw the 4 IGBT screws **M5X16 DIN-7895H**, with a tightening pressure of **5N/m**.
- 4) Fix the 6 nuts **M5** that join the fan structure and the connections board.
- 5) Insert the 2 plastic screws **M3x8 DIN-933**.
- 6) Insert the Phillips screw **M3x8 DIN-7895H** of the chassis.
- 7) Connect the NTC cable.

7.2.10. SINGLE-PHASE CHOKES

Disassembly of the single-phase chokes

In order to remove the single-phase choke, you should remove the embellishers (see section 7.2.1) and the tray for the boards (see figure 7.2.7) before.

- 1) It is necessary to disconnect the power cables in order to remove the single-phase chokes from the chassis of the drive. For this, disconnect the power cables which are connected to the power connections board (see figure 7.2.17).
- 2) Remove the 6 nuts **M5** which join the fan structure and the power connections board (see figure 7.2.14).

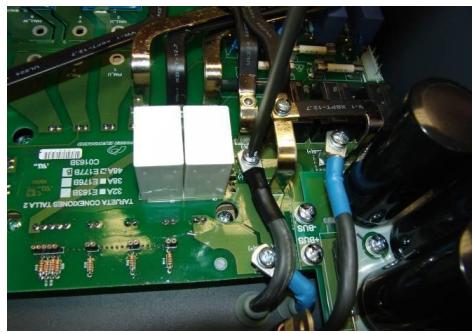


Figure 7.2.17

- 3) Remove the 4 screws **M6X16 DIN-7895H** which join the upper chassis and the lower chassis.
- 4) Remove the top of the chassis and put it face down (see figure 7.2.18).

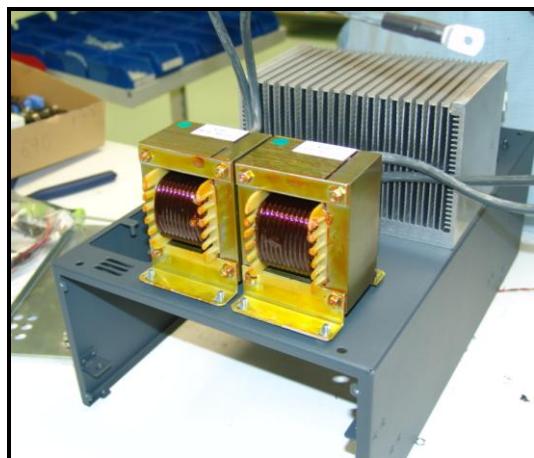


Figure 7.2.18

- 5) Remove the 8 nuts M5 which fix the chokes to the chassis.
- 6) Remove the chokes.

Assembly of the single-phase chokes

- 1) Fix the new single-phase chokes to the chassis by using the nuts **M5**.
- 2) Take the cables of the chokes toward the top of the chassis (see figure 7.2.18).



Figure 7.2.18

- 3) Connect the cables of the chokes to the power connections board (see figure 7.2.17).
- 4) Approach and fix the fan structure to the power connections board by using the 6 nuts **M5**.
- 5) Assembly again the top of the chassis with the bottom of the chassis by using the 4 screws **M6X16 DIN-7895H**.

7.2.11. DV/DT CHOKES

Disassembly of dV/dt chokes

It is necessary to remove the embellishers (see section 7.2.1), the tray for the boards (see figure 7.2.7) and separate the top of the chassis from the bottom (follow the steps described in section 7.2.9 and 7.2.10)

Follow the steps while seeing the figure 7.2.19.



Figure 7.2.19

- 1) Remove the 4 screws (**M4x8 DIN-7895H**) which fix dV/dt chokes to the chassis (see figure 7.2.22).
- 2) Remove the 4 screws (**M4x8 DIN-7895H**) which join the fan structure to the chassis (see figure 7.2.22).



Figure 7.2.22

- 3) Disconnect all the cables of dV/dt choke which are joined to the fan structure (see figure 7.2.20).



Figure 7.2.20

- 4) Once disconnected the cables, cut the terminals in order to get the cables out the structure (see figure 7.2.21).



Figure 7.2.21

- 5) Remove dV/dt chokes.

Assembly dV/dt chokes

- 1) Put the cables of the new dV/dt choke through the holes of the fan structure (see figure 7.2.21).
- 2) Put the terminals of the new dV/dt choke and connect them to the fan structure (see figures 7.2.23 and 7.2.20).



Figure 7.2.23

- 3) Fix the fan structure to the chassis by using the 4 screws (**M4x8 DIN-7895H**). See figure 7.2.22.
- 4) Fix dV/dt chokes to the chassis by using the 4 screws (**M4x8 DIN-7895H**). See figure 7.2.22.
- 5) Assembly again the top and the bottom of the chassis. Follow the steps described in section 7.2.10 (see figure 7.2.18).

7.2.12. HEATSINK

Disassembly of the heatsink

In order to remove de heatsink, first, you should remove the embellishers (see section 7.2.1), the tray for the boards (see figure 7.2.7), the gate drive board (see section 7.2.7), the DC bus (see section 7.2.8) and the power connections board (see section 7.2.9).

- 1) Once removed the components mentioned before, remove the screws that join the upper chassis and the lower chassis (see figure 7.2.18).
- 2) Remove the 4 screws **M5x10** that fix the heatsink to the chassis of the drive (see figure 7.2.24).



See figure 7.2.24

- 3) Remove the heatsink.

Assembly of the heatsink

- 1) Fix the new heatsink to the chassis by using 4 screws **M5x10**, with a tightening pressure of **3N/m**.
- 2) Join the top and the bottom of the chassis.
- 3) Spread the heatsink area where the IGBT of the power connections board is going to be placed, with thermal-conductor paste.
- 4) Fix the power connections board (see section 7.2.19).
- 5) Fix the DC bus (see section 7.2.8).
- 6) Fix the gate drive board (see section 7.2.7).

1.1.13 FANS

Disassembly of the fan of the heatsink

- 1) Remove the lower cover (see section 7.2.3).
- 2) Disconnect the power supply cable.
- 3) Remove the 2 screws **M4x45 DIN-84** that fix the fan to the structure (see figure 7.2.25).
- 4) Remove the fan.



Figure 7.2.25

Assembly of the fan of the heatsink

- 1) Put the new fan and fix it with the screws.
- 2) Connect the power supply cable.
- 3) Fix the cover.

Disassembly of the fan of the lateral internal cover

- 1) Remove the lateral internal cover (see section 7.2.1).
- 2) Disconnect the power supply cable.
- 3) Remove 2 screws **M4x35 DIN-84** which join the fan and the chassis. See figure 7.2.26.
- 4) Remove the fan.



Figure 7.2.26

Assembly of the fan of the lateral internal cover

- 1) Put the new fan and fix it with the screws.
- 2) Connect the power supply cable.

7.3. SD700 FRAME 3 (60-75A)

7.3.1. ACCESS TO THE INSIDE OF THE DRIVE.

Disassembly of the embellishers

In order to repair or replace any component of the drive, you should access to the inside of it.

See figure 7.3.1 and figure 7.3.2 while reading the following instructions:

- 1) Open the door of the drive.
- 2) Disconnect the Display. For this, disconnect ethernet cable which joins the display and the drive. Push the tab of the RJ45 connector and pull it up.
- 3) Disconnect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).

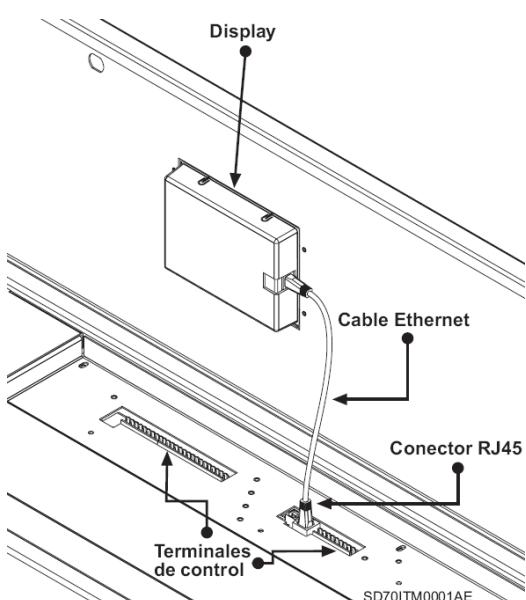


Figure 7.3.1 Display connection and control terminals

- 4) Remove the 4 Phillips **M4x8 DIN-7895H** screws, with their corresponding washers and lock washers, which join the embellishers to the chassis of the drive.
- 5) In case of IP54 model of SD700 drives, disconnect the power supply of the fans that are in the embellishers.
- 6) Remove the embellishers.

- 7) Remove the plastic protector for the power connections.



Figure 7.3.2 Access to the inside of the drive

Assembly of the embellishers

- 1) Place the embellishers on the supports of the drive's sides as the figures 7.3.2 shows.
- 2) Screw the embellishers to the supports of the sides with 4 Phillips **M4x8 DIN-7895H** screws.
- 3) Put the plastic protector for the power connections on the sides of the drive.
- 4) Connect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).
- 5) Connect the Display by means of the ethernet cable which goes from the display to the drive.

7.3.2. DOOR

Disassembly the door

See the figure 7.3.3 while following the next instructions:

- 1) Open the door.
- 2) Disconnect the ethernet cable from the display.
- 3) Remove the display from the support of the door.
- 4) Disconnect the earth cable.
- 5) Remove the 2 special screws of the door's hinges **M6x12**, which join the door to the side of the drive.
- 6) Remove the door.



Figure 7.3.3 Remove the door

Assembly the door

- 1) Put the door matching the hinges with the holes of the side.
- 2) Insert the special screws of the door's hinges **M6x12**, which join the door to the side of the drive.
- 3) Put the display on the support of the door.
- 4) Connect the ethernet cable of the display.

7.3.3. UPPER COVER AND LOWER COVERS.

Disassembly of the upper cover and lower covers

See the figure 7.3.4 while following the next instructions:

- 1) Unscrew the 7 Phillips **M4x8** DIN-7895H screws that join the upper cover and the drive chassis.
- 2) In IP20 models, remove the upper cover slowly until disconnecting the power supply cable of the fans. Once disconnected the cable, remove the cover completely.
- 3) Unscrew the 6 Phillips **M4x8** DIN-7895H screws which join the lower covers and the drive chassis.
- 4) Remove the lower covers.

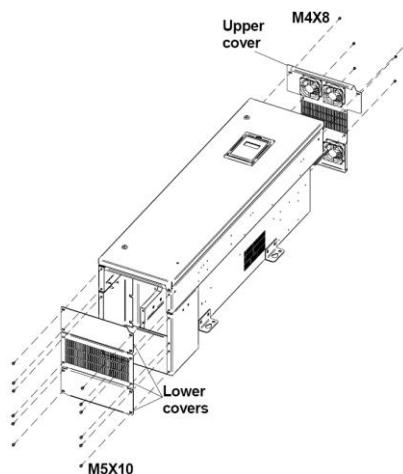


Figure 7.3.4 Remove the covers.

Assembly of the upper cover and the lower covers

- 1) Put the lower covers as the figure 7.3.4 shows.
- 2) Fix the covers to the chassis of the drive by using the 6 Phillips screws **M4x8** DIN-7895H that join the lower covers and the chassis.
- 3) Move the upper cover closer to the chassis of the drive, and connect the power supply cable of the fans.
- 4) Screw the upper cover to the drive chassis by using the 7 Phillips screws **M4x8** DIN-7895H.

7.3.4. CONTROL BOARD

Disassembly of the control board

The use of a static grounding wrist strap and being earthed is highly required to repair the unit.

See the figure 7.3.5 while reading the following instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control board and the plastic hexagonal spacers **M3x20**.
- 2) Remove the control board by pulling it up, until disconnecting the female connectors of 40, 32 and 28 pins of the control board, from the male connectors of the power board where control board is connected.
- 3) Once the control board is removed, put this board into a static proof bag for a safekeeping.

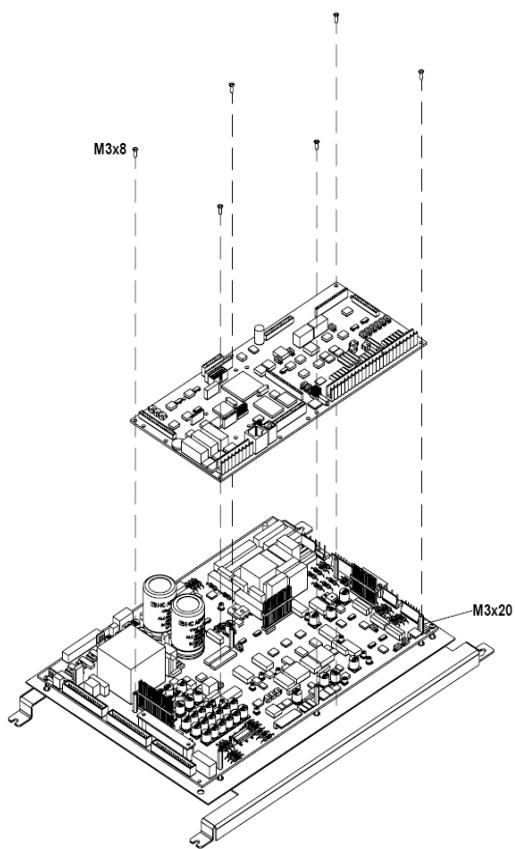


Figure 7.3.5 Remove the control board.

Disassembly of the control board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the control board, avoid an excessive handling of the board.
- 3) Pick the new control board from the static proof bag.
- 4) Put the new control board in the same place than the replaced one, matching the board holes with the hexagonal plastic spacers **M3x20** (see figure 7.3.5).
- 5) Match the male connector of 40, 32 and 28 pins of the control board with the corresponding female connector of the power board and slightly push the control board down to connect the pins.
- 6) Once the board is properly placed, screw the 6 plastic screws **M3x8** DIN-933 in the corresponding hexagonal plastic spacers **M3x20**.

7.3.5. POWER BOARD

Disassembly of the power board

Before proceeding, the control board must have been disassembled (see section 7.3.4).

See the figure 7.3.6 while reading the following instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect all the wires which are connected to this board.

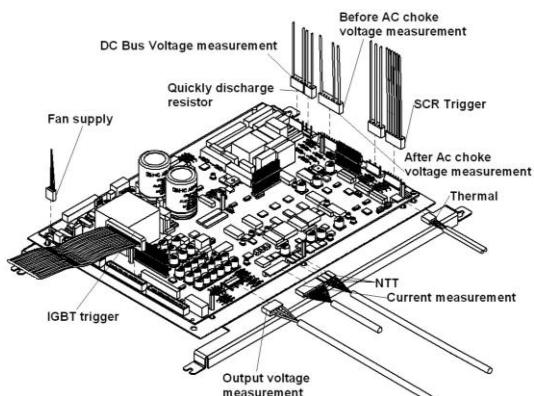


Figure 7.3.6. Disconnect all connected wires from power board

- 3) Remove the 6 hexagonal plastic spacers **M3x20**, which are joined to the electronic tray, and support the control board.
- 4) Unscrew the 6 Phillips screws **M3x8 DIN-7895H**.
- 5) Remove the power board of the drive.

Assembly of the power board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the power board, avoid an excessive handling of the board.
- 3) Pick the new power board from the static proof bag.
- 4) Put the new power board in the same place than the replaced one.
- 5) Put the board on the electronic tray, matching the bolts of the tray with the holes of the board (see figure 7.3.7).

- 6) Once the board is properly placed, screw the 6 Phillips screws **M3x8 DIN-7895H** in the bolts of the electronic tray.
- 7) Connect the cables to the corresponding connectors (see figure 7.3.6).
- 8) Put the hexagonal plastic spacers **M3x20**, screwing them in their corresponding bolts of the electronic tray, in order to place the control board later.

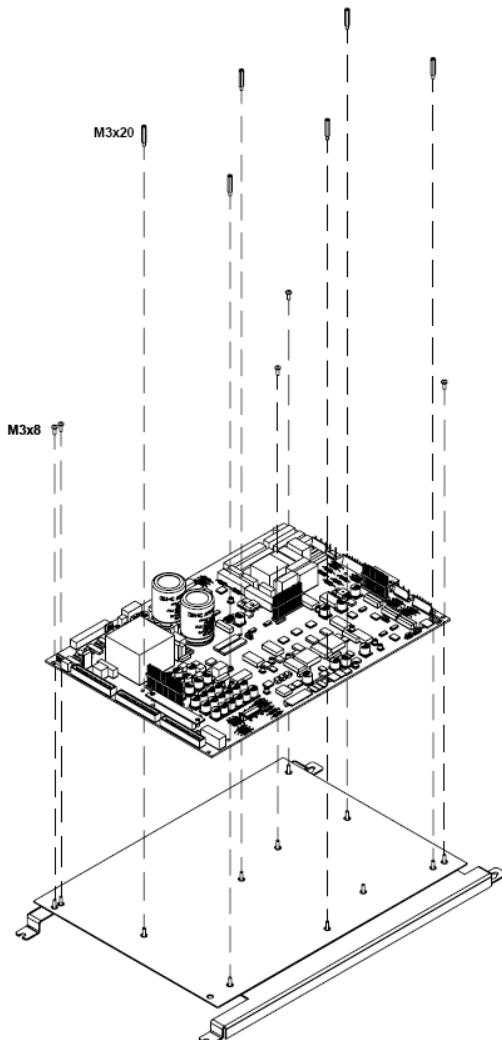


Figure 7.3.7. Disassembly of the power board

7.3.6. DRIVE SELECT BOARD

Disassembly of Drive Select board

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this board and the plastic hexagonal spacers **M3x12**.

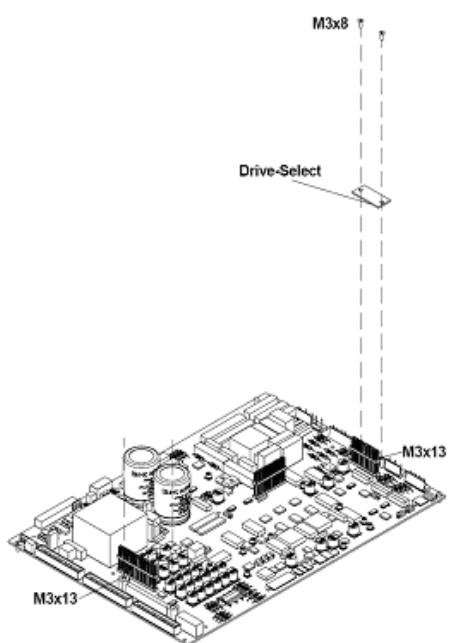


Figure 7.3.8. Disassembly of the Drive Select board

Assembly of Drive Select board

Put the drive select board on the 2 plastic hexagonal spacers **M3x13** and join them with 2 plastic screws **M3x8** DIN-933.

7.3.7. PLUGGABLE PCB OF TRIGGER THYRISTORS.

Disassembly of the pluggable PCB of trigger thyristors

Before removing the pluggable PCB of trigger thyristos, it is necessary to remove the tray where the control and power boards are inserted. For this, remove the 4 Phillips screws **M4x8** DIN-7895H, which join this tray with the sides of the drive's chassis.

See the figure 7.3.9:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the 3 cables from the thyristors and the communication cable from the pluggable PCB.



Figure 7.3.9. Disassembly of the pluggable PCB of trigger thyristors.

- 3) Remove the 4 plastic screws **M3x8** DIN-933, which join the back of the board to the 4 hexagonal plastic spacers **M3x10** which are inserted in the power connections board.
- 4) Remove the board.

Disassembly of the pluggable PCB of trigger thyristors

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the pluggable PCB of trigger thyristors, avoid an excessive handling of the board.
- 3) Pick the pluggable PCB of trigger thyristors from the static proof bag.

- 4) Put the board in the proper position as the figure 7.3.9 (c) shows, matching the holes in the hexagonal plastic spacers **M3x10**, and plug the board in the connector of the power connections board.
- 5) Insert the 4 plastic screws **M3x8 DIN-933**, which join the back of the board to the hexagonal plastic spacers **M3x10**.
- 6) Connect the cables to the thyristors and the communication cables to the power board.



Figure 7.3.9 (c). Disassembly of the pluggable PCB of trigger thyristors

7.3.8. POWER CONNECTIONS

BOARD

Disassembly of the power connections board

Before proceeding, you should remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7), and the pluggable PCB of the trigger thyristors (see section 7.3.7).

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Remove the 9 screws that are fixed to the thyristors, the 2 screws that are fixed to the bus, and the 4 screws that are fixed to the IGBT (M5X12 DIN-7895H).
- 3) Remove the 3 screws that are fixed to the AC choke (**M6x16 DIN-7895H**).
- 4) Remove the 5 Phillips screws **M3x6 DIN-7895H**. See figure 7.3.10.

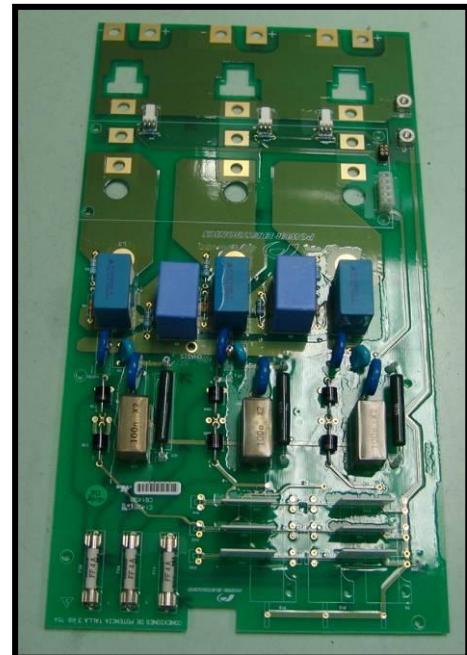


Figure 7.3.10. Disassembly of the power connections board

Assembly of the power connections board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the power connections board, avoid an excessive handling of the board.
- 3) Pick the new power connections board from the static proof bag.

- 4) Put the board in the correct position as the figure 7.3.10 shows, matching the holes with the thyristors, the choke and with the bus.
- 5) Insert the 5 Phillips screws **M3x6 DIN-7895H**.
- 6) Insert the 9 screws which are fixed to the bus and also, the 4 screws which are fixed to the IGBT (M5X12 DIN-7895H) with a tightening pressure of **3N/m**.
- 7) Insert the screws that are fixed to the AC choke (**M6x16 DIN-7895H**) with a tightening pressure of **3N/m**.
- 8) Plug the PCB of trigger thyristors. See figure 7.3.9 (c).

7.3.9. DC BUS

Disassembly of DC Bus

Before proceeding, you should remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7), the pluggable PCB of trigger thyristors (see section 7.3.7), and the power connections board (see figure 7.3.10).

- 1) Disconnect the 2 power cables from the DC bus, with the 2 screws (**M5X12 DIN-7895H**).
- 2) Remove the 4 Phillips screws **M4x8 DIN-7895H** which join the bus and the chassis.
- 3) Remove the DC bus.



Figure 7.3.12. Disassembly of DC Bus

Assembly of DC Bus

- 1) Put the bus correctly in the chassis, matching the holes.
- 2) Insert the 4 Phillips screws **M4x8 DIN-7895H** that join the bus and the chassis.
- 3) Insert the power connections board (see figure 7.3.11).
- 4) Insert the 2 screws (**M5X12 DIN-7895H**) which join the power connections board and the DC bus.
- 5) Connect the two power cables to the DC bus with screws (**M5X12 DIN-7895H**).

7.3.10. UPPER GATE DRIVE BOARD

Disassembly of the upper Gate Drive board

Before removing the upper Gate Drive board, you should remove the embellishers (see section 7.3.1) and the tray for the boards (see figure 7.3.7).

- 1) Disconnect the flat cable and the phone cables.
- 2) Remove the 6 plastic screws **M3x8 DIN-933**. (See figure 7.3.13).
- 3) Remove *the board*.

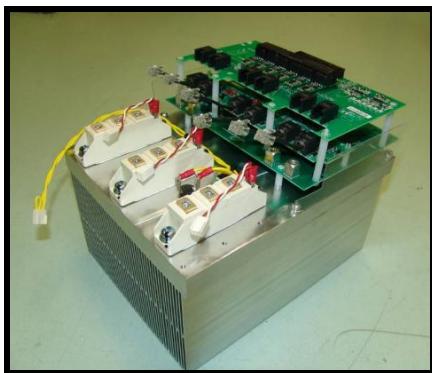


Figure 7.3.13. Disassembly of the upper Gate Drive board

Assembly of the upper Gate Drive board

- 1) Put the board in the correct position (see figure 7.3.13).
- 2) Insert the 6 plastic screws **M3x8 DIN-933**.
- 3) Connect the flat cable and the phone cables.

7.3.11. MEDIUM AND LOWER GATE DRIVE BOARD.

Disassembly of the medium and lower Gate Drive board

Before removing the medium and lower Gate Drive board, you should remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7), the power connections board (see section 7.3.8) and the upper Gate Drive board (see section 7.3.10).

See figure 7.3.13 while following the next instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the power cable of dV/dt chokes, the temperature cable of the IGBT's and the fault cable.
- 3) Remove the 4 screws (**M5X16 DIN-7895H**) that fix the IGBT to the heatsink.
- 4) Remove the medium and lower Gate Drive boards together (see figure 7.3.14).

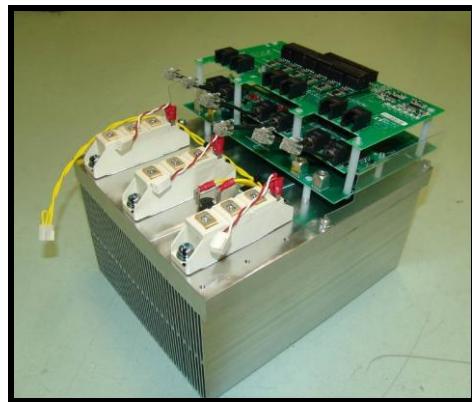


Figure 7.3.14. Disassembly of the medium and lower Gate Drive boards

Assembly of the medium and lower Gate Drive board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) Spread the heatsink area where the IGBT is going to be placed with new thermal paste.
- 3) Put the IGBT matching the fixing holes (see figure 7.3.14).
- 4) Insert the fixing screws of the IGBT (**M5X16 DIN-7895H**) and tighten at **5 N/m**.
- 5) Connect the flat cable, the temperature cable of the IGBT and the power cables which are connected to the dV/dt choke.

7.3.12. CURRENT TRANSFORMERS.

Disassembly of the current transformers

Before removing the transformers, you should remove the embellishers (see section 7.3.1) and the tray boards (figure 7.3.7).

See the figure 7.3.15 while following the next instructions:

- 1) Disconnect the 3 current measurement cables of the transformers and the 3 screws (**M6x16 DIN-7895H**) which connect dV/dt choke to the output.
- 2) Remove the 3 Phillips screws **M4x8 DIN-7895H** that join the current transformers with the chassis.
- 3) Remove the current transformers.



Figure 7.3.15. Disassembly of the current transformers

Assembly of the current transformers

- 1) Insert the Phillips screws **M4x8 DIN-7895H** and fix the transformers to the chassis.
- 2) Connect the cables of the current transformers.
- 3) Put the cables of dV/dt chokes on the inside of the transformers and connect them to the output by using 3 screws (**M6x16 DIN-7895H**) and tighten at **5 N/m**.

7.3.13. AC CHOKE

Disassembly of the AC choke

In order to remove the AC choke, first, you should remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7), the power connections board (see section 7.3.8), the DC bus (see section 7.3.9), and the tray where the connections board is supported (see figure 7.3.16).

See the figure 7.3.17 while following the next instructions:

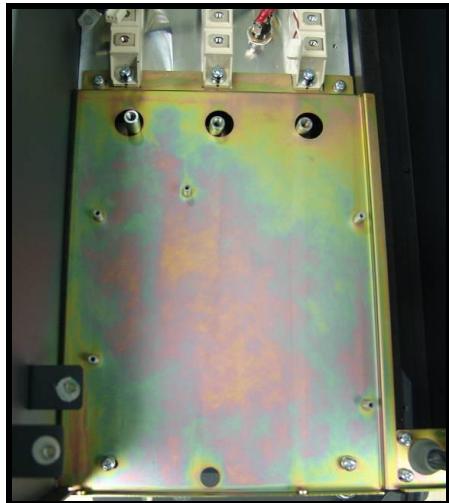


Figure 7.3.16

- 1) It is necessary to remove the power cables in order to remove the AC choke from the drive's chassis. For this, remove the power cables like this (see figure 7.3.17).
- 2) Remove the 4 Phillips screws **M6x20 DIN-7895H** that join the AC choke to the supports of the chassis (see figure 7.3.17).



Figure 7.3.17

- 3) Remove the AC choke (see figure 7.3.18).

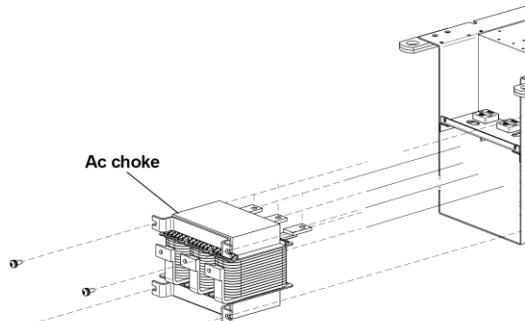


Figure 3.18. Disassembly of the AC choke

Assembly of the AC choke

- 1) Insert the AC choke inside the chassis.
- 2) Fix the AC choke to the chassis by using the 4 screws **M6x20 DIN-7895H**.
- 3) Connect the power cables to the choke as the figure 7.3.17 shows.
- 4) Insulate the power cables (see figure 7.3.18).

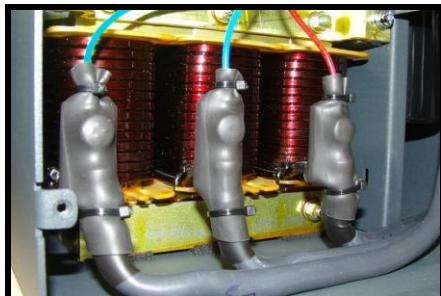


Figure 7.3.18

7.3.14. DV/DT CHOKES

Disassembly of the dV/dt chokes

It is necessary to remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7), the power connections board (see section 7.3.8), the DC Bus (see section 7.3.9), the control cable bars (see figure 7.3.21), the bar for connectios (see figure 7.3.19) and the medium bar (see figure 7.3.20).



Figure 7.3.19

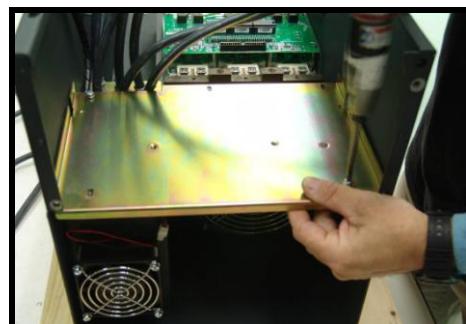
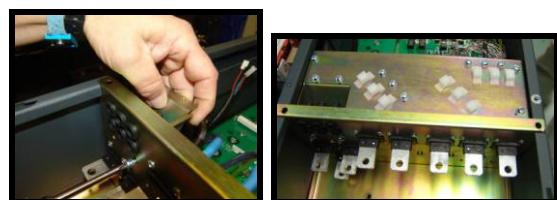


Figure 7.3.20

- 1) Remove the protection bars for the control cables. Figure 7.3.21.



Figures 7.3.21

- 2) Disconnect all cables which are joined to the connections bar and the three cables of dV/dt choke which go to the lower gate drive board (see figure 7.3.22).



Figure 7.3.22

- 3) Remove the 2 screws **M4x8 DIN-7895H** which fix the connections bar to the chassis.
- 4) Remove the connections bar.
- 5) Remove the 5 screws (**M4x8 DIN-7895H**) which fix the medium bar.
- 6) Remove the medium bar.
- 7) Remove the 2 screws (**M4x8 DIN-7895H**) which hold the fixing bar for the fan cables to the chassis (see figure 7.3.23).

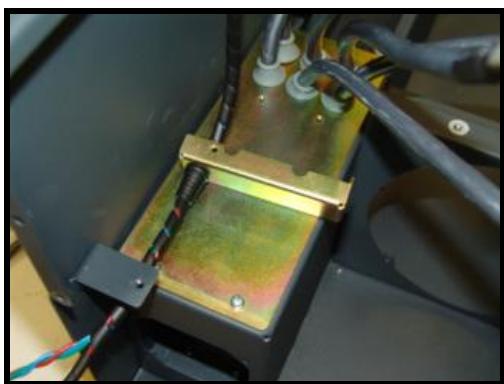


Figure 7.3.23

- 8) Remove the screws which fix dV/dt chokes to the top of the chassis (see figure 7.3.24).



Figure 7.3.24

- 9) Remove the 4 screws (**M4x8 DIN-7895H**) which fix dV/dt chokes to the bottom of the chassis (see figure 7.3.25).



Figure 7.3.25

- 10) Remove *dV/dt chokes*.

Assembly of dV/dt chokes

- 1) Put the new dV/dt chokes matching their holes and fix them at the bottom by using 4 screws (**M4x8 DIN-7895H**). See figure 7.3.25.
- 2) Fix the upper bar of dV/dt chokes with their 4 screws (**M4x8 DIN-7895H**) to the drive's chassis (see figure 7.3.24).
- 3) Hold the fixing bar of the fan cables with their 2 screws (**M4x8 DIN-7895H**) (see figure 7.3.23).
- 4) Fix the medium bar by using 5 screws (**M4x8 DIN-7895H**). See figure 7.3.20.
- 5) Fix the connections bar with the 2 screws (**M4x8 DIN-7895H**).
- 6) Connect the cables of dV/dt choke, the upper cables are connected to the lower gate drive board, and the lower cables are connected to the output in the connections bar.
- 7) Connect the remaining cables of the DC Bus and the power cables coming from the choke.

7.3.15. THYRISTORS

Disassembly of the thyristors

Before removing the thyristors, you should remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7) and the power connections board (see section 7.3.8).

See the figure 7.3.26 while following the next instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the control cable of the thyristors.
- 3) Remove the Phillips screws **M5x16 DIN-7895H** which join the thyristors and their heatsink.
- 4) Remove the thyristor.

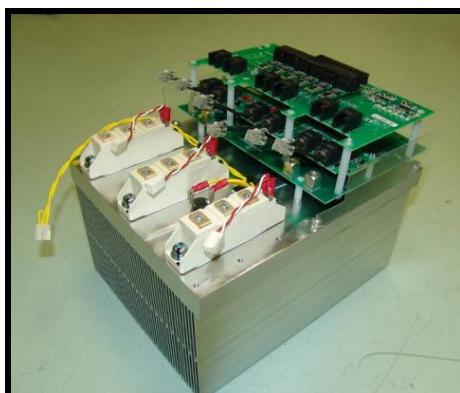


Figure 7.3.26

Assembly of the thyristors

- 1) Take the new thyristors and spread with thermal-conductor paste the bottom of the thyristors.
- 2) Put them over the heatsink, matching the holes of the thyristor with the holes of the heatsink as the figure 7.3.26 shows.
- 3) Insert the Phillips screws **M5x16 DIN-7895H** which join the thyristors with their heatsink.
- 4) Connect the control cables of the thyristors.

7.3.16. FANS

Disassembly of the power heatsink fan

See the figure 7.3.27 while following the next instructions:

- 1) Disconnect the power supply fan of the fan.
- 2) Remove the 2 slotted cheese head screws **M4x60 DIN-84** which join the power fan with the chassis.
- 3) Remove the fan.

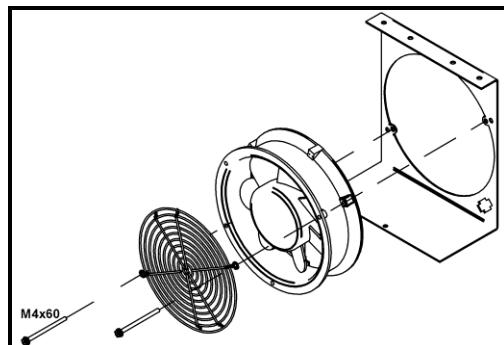


Figura 7.3.27

Assembly of the power heatsink fan

- 1) Put the new fan and fix it with the screws.
- 2) Connect the power supply cable to the fan.

Disassembly of the fan for the toroids

See figure 7.3.28 while following the next instructions:

- 1) Disconnect the power supply cable.
- 2) Remove the 4 slotted cheese head screws **M4x40 DIN-84** which join the fan with the chassis.
- 3) Remove the fan.



Figura 7.3.28

Assembly of the fan for the toroids

- 1) Put the new fan and fix it by using the screws.
- 2) Connect the power fan cable to the fan.

7.3.17. HEATSINK**Disassembly of the heatsink**

In order to remove the heatsink, first, you should remove the embellishers (see section 7.3.1), the tray for the boards (see figure 7.3.7), the power connections board (see section 7.3.8), the DC bus (see section 7.3.9), the upper gate drive board (see section 7.3.10), the medium and lower gate drive board (see section 7.3.11), the thyristors (see section 7.3.15), and the fans (only the fan for the power heatsink) (see section 7.3.16).

- 1) Remove the 2 Phillips screws **M5x12 DIN-7895H** which fix the heatsink to the side of the chassis (see figure 7.3.29).



Figure 7.3.29

- 2) Remove the 2 Phillips screws **M5x12 DIN-7895H** which fix the heatsink by the top (see figure 7.3.30).



Figure 7.3.30

- 3) Remove the heatsink.

Assembly of the heatsink

- 1) Put the new heatsink in the correct position and fix it with their 4 Phillips screws **M5x12 DIN-7895H**.
- 1) Take the thyristors and the lower gate drive board and spread the thermal-conductor paste on the bottom (see figure 7.3.31).
- 2) Follow all the steps described previously in order to insert all the components again.

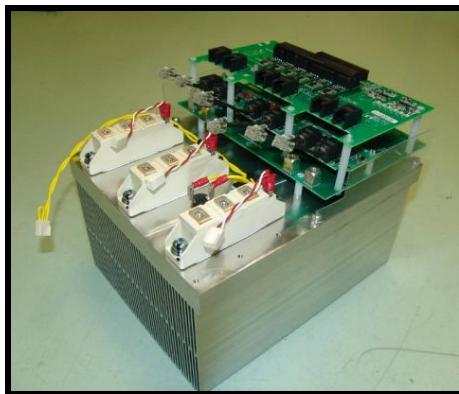


Figure 7.3.31

7.3.18. DISCHARGING RESISTOR.

Disassembly of the discharging resistor

In order to remove the discharging resistor, first, you should remove the embellishers (see section 7.3.1).

- 1) Remove the 2 screws **M3x6 DIN-7895H** which fix the discharging resistor to the electronic tray (see figure 7.3.32).
- 2) Remove the discharging resistor.



Figure 7.3.32

Assembly of the discharging resistor

- 1) Put the new discharging resistor in the correct position on the electronic tray.
- 2) Fix the discharging resistor to the electronic tray by using the 2 screws **M3x6 DIN-7895H**.

7.3.19. BUS CAPACITORS

Disassembly of the bus capacitors

It is necessary to remove the DC Bus of the drive, before performing this action (see section 7.3.9).

See figure 7.3.33 while following the next instructions:

- 1) Unscrew the 8 special hexagonal screws M5X10 which fix the capacitors to the electronic board of the bus (see figure 7.3.33).
- 2) Remove the electronic board.
- 3) Remove the capacitors which are going to be repaired.

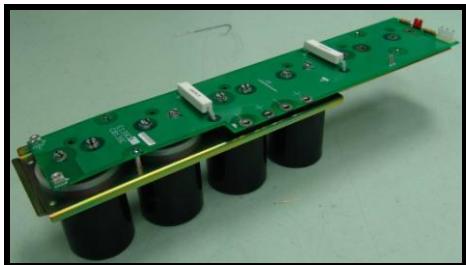


Figure 7.3.33

Assembly of the bus capacitors

- 1) Put the new capacitor on the ring which is inserted in the capacitor support.
- 2) Put the electronic board of the bus and the capacitors in the correct position.
- 3) Insert the screws of the capacitors with a tightening pressure of **3N/m**.

7.4. SD700 FRAME 3 (90-115A)

7.4.1. ACCESS TO THE INSIDE OF THE DRIVE.

Disassembly of the embellishers

In order to repair or replace any component of the drive, you should access to the inside of it.

See figure 7.4.1 and figure 7.4.2 while reading the following instructions:

- 1) Open the door of the drive.
- 2) Disconnect the Display. For this, disconnect ethernet cable which joins the display and the drive. Push the tab of the RJ45 connector and pull it up.
- 3) Disconnect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).

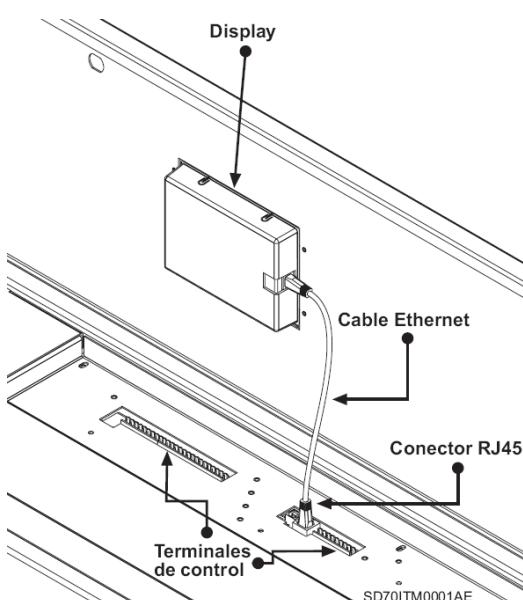


Figure 7.4.1 Display connection and control terminals

- 4) Remove the 4 Phillips M4x8 DIN-7895H screws, with their corresponding washers and lock washers, which join the embellishers to the chassis of the drive.
- 5) In case of IP54 model of SD700 drives, disconnect the power supply of the fans that are in the embellishers.
- 6) Remove the embellishers.

- 7) Remove the plastic protector for the power connections.



Figure 7.4.2 Access to the inside of the drive

Assembly of the embellishers

- 1) Place the embellishers on the supports of the drive's sides as the figures 7.4.2 shows.
- 2) Screw the embellishers to the supports of the sides with 4 Phillips M4x8 DIN-7895H screws.
- 3) Put the plastic protector for the power connections on the sides of the drive.
- 4) Connect all cables from the control terminals of the drive (analogue inputs and outputs, digital inputs and outputs, PTC input ...).
- 5) Connect the Display by means of the ethernet cable which goes from the display to the drive.

7.4.2. DOOR

Disassembly the door

See the figure 7.4.3 while following the next instructions:

- 1) Open the door.
- 2) Disconnect the ethernet cable from the display.
- 3) Remove the display from the support of the door.
- 4) Disconnect the earth cable.
- 5) Remove the 2 special screws of the door's hinges **M6x12**, which join the door to the side of the drive.
- 6) Remove the door.



Figure 7.4.3 Remove the door

Assembly the door

- 1) Put the door matching the hinges with the holes of the side.
- 2) Insert the special screws of the door's hinges **M6x12**, which join the door to the side of the drive.
- 3) Put the display on the support of the door.
- 4) Connect the ethernet cable of the display.

7.4.3. UPPER COVER AND LOWER COVERS

Disassembly of the upper cover and lower covers

See the figure 7.4.4 while following the next instructions:

- 1) Unscrew the 7 Phillips **M4x8 DIN-7895H** screws that join the upper cover and the drive chassis.
- 2) In IP20 models, remove the upper cover slowly until disconnecting the power supply cable of the fans. Once disconnected the cable, remove the cover completely.
- 3) Unscrew the 6 Phillips **M4x8 DIN-7895H** screws which join the lower covers and the drive chassis.
- 4) Remove the lower covers.

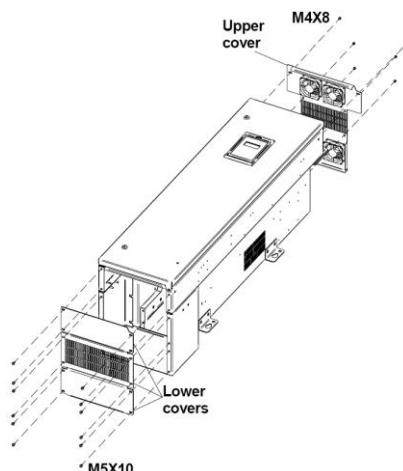


Figure 7.4.4 Remove the covers

Assembly of the upper cover and the lower covers

- 1) Put the lower covers as the figure 7.4.4 shows.
- 2) Fix the covers to the chassis of the drive by using the 6 Phillips screws **M4x8 DIN-7895H** that join the lower covers and the chassis.
- 3) Move the upper cover closer to the chassis of the drive, and connect the power supply cable of the fans.
- 4) Screw the upper cover to the drive chassis by using the 7 Phillips screws **M4x8 DIN-7895H**.

7.4.4. CONTROL BOARD

Disassembly of the control board

The use of a static grounding wrist strap and being earthed is highly required to repair the unit.

See the figure 7.4.5 while reading the following instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control board and the plastic hexagonal spacers **M3x20**.
- 2) Remove the control board by pulling it up, until disconnecting the female connectors of 40, 32 and 28 pins of the control board, from the male connectors of the power board where control board is connected.
- 3) Once the control board is removed, put this board into a static proof bag for a safekeeping.

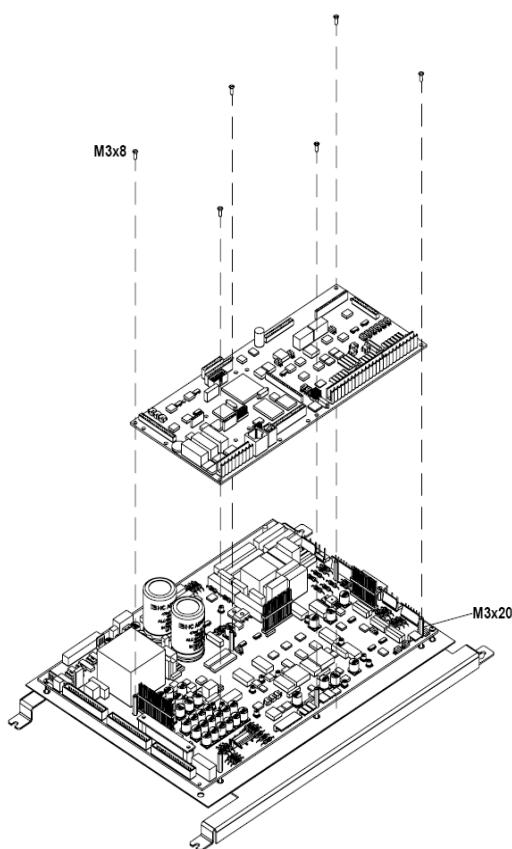


Figure 7.4.5 Remove the control board.

Assembly of the control board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the control board, avoid an excessive handling of the board.
- 3) Pick the new control board from the static proof bag.
- 4) Put the new control board in the same place than the replaced one, matching the board holes with the hexagonal plastic spacers **M3x20** (see figure 3.5).
- 5) Match the male connector of 40, 32 and 28 pins of the control board with the corresponding female connector of the power board and slightly push the control board down to connect the pins.
- 6) Once the board is properly placed, screw the 6 plastic screws **M3x8** DIN-933 in the corresponding hexagonal plastic spacers **M3x20**.

7.4.5. POWER BOARD

Disassembly of the power board

Before proceeding, the control board must have been disassembled (see section 7.4.4).

See the figure 7.4.6 while reading the following instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect all the wires which are connected to this board.

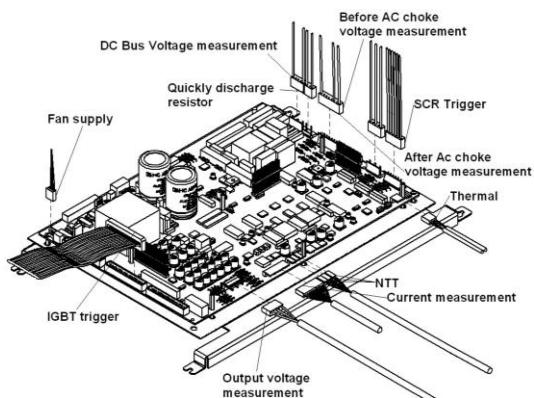


Figure 7.4.6. Disconnect all connected wires from power board

- 3) Remove the 6 hexagonal plastic spacers **M3x20**, which are joined to the electronic tray, and support the control board.
- 4) Unscrew the 6 Phillips screws **M3x8 DIN-7895H**.
- 5) Remove the power board of the drive.

Assembly of the power board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the power board, avoid an excessive handling of the board.
- 3) Pick the new power board from the static proof bag.
- 4) Put the new power board in the same place than the replaced one.
- 5) Put the board on the electronic tray, matching the bolts of the tray with the holes of the board (see figure 7.4.7).

- 6) Once the board is properly placed, screw the 6 Phillips screws **M3x8 DIN-7895H** in the bolts of the electronic tray.
- 7) Connect the cables to the corresponding connectors (see figure 7.4.6).
- 8) Put the hexagonal plastic spacers **M3x20**, screwing them in their corresponding bolts of the electronic tray, in order to place the control board later.

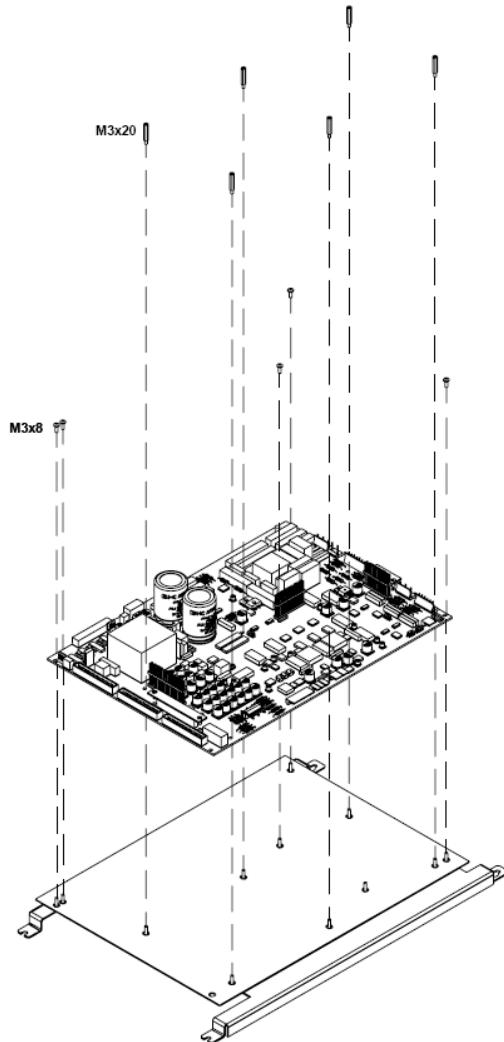


Figure 7.4.7. Disassembly of the power board

7.4.6. DRIVE SELECT BOARD

Disassembly of Drive Select Board

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this board and the plastic hexagonal spacers **M3x12**.

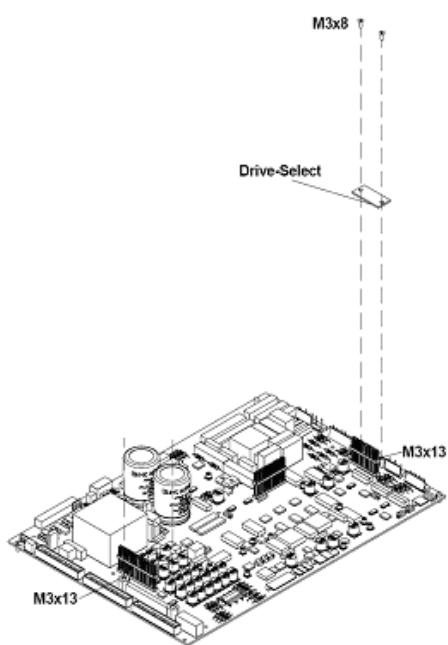


Figure 7.4.8. Disassembly of the Drive Select board

Assembly of Drive Select Board

Put the drive select board on the 2 plastic hexagonal spacers **M3x13** and join them with 2 plastic screws **M3x8** DIN-933.

7.4.7. PLUGGABLE PCB OF TRIGGER THYRISTOR

Disassembly of the pluggable PCB of trigger thyristors

Before removing the pluggable PCB of trigger thyristos, it is necessary to remove the tray where the control and power boards are inserted. For this, remove the 4 Phillips screws **M4x8** DIN-7895H, which join this tray with the sides of the drive's chassis.

See the figure 7.4.9:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the 3 cables from the thyristors and the communication cable from the pluggable PCB.



Figure 7.4.9. Disassembly of the pluggable PCB of trigger thyristors.

- 3) Remove the 4 plastic screws **M3x8** DIN-933, which join the back of the board to the 4 hexagonal plastic spacers **M3x10** which are inserted in the bus bars and the power connections board.
- 4) Remove the board.

Disassembly of the pluggable PCB of trigger thyristors

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the pluggable PCB of trigger thyristors, avoid an excessive handling of the board.
- 3) Pick the pluggable PCB of trigger thyristors from the static proof bag.
- 4) Put the board in the proper position as the figure 7.4.9 shows, matching the holes in the hexagonal plastic spacers **M3x10**, and plug the board in the connector of the power connections board.

- 5) Insert the 4 plastic screws **M3x8 DIN-933**, which join the back of the board to the hexagonal plastic spacers **M3x10**.
- 6) Connect the cables to the thyristors and the communication cables to the power board.



Figure 7.4.9 (c). Disassembly of the pluggable PCB of trigger thyristors

7.4.8. POWER

COINNECTIONS BOARD

Disassembly of the power connections board

Before proceeding, you should remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7), the pluggable PCB of the trigger thyristors (see section 7.4.7) and the bars for the connections to the thyristors (see figure 7.4.10 a).

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Remove the 3 screws that are fixed to the AC choke (**M6x16 DIN-7895H**).
- 3) Remove the 5 Phillips screws **M3x6 DIN-7895H**. See figure 7.4.10.

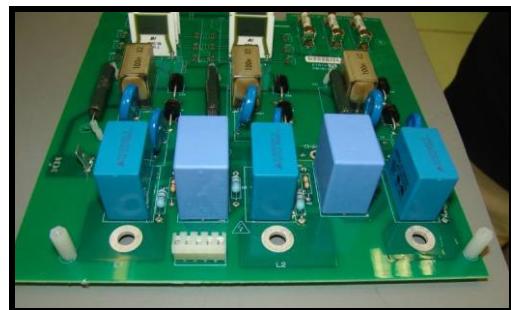


Figure 7.4.10. Disassembly of the power connections board

Assembly of the power connections board

- 1) Continue with the safety conditions which are described in the previous section.
- 2) While replacing the power connections board, avoid an excessive handling of the board.
- 3) Pick the new power connections board from the static proof bag.
- 4) Put the board in the correct position as the figure 7.4.10 shows, matching the holes with the choke.
- 5) Insert the 5 Phillips screws **M3x6 DIN-7895H**.
- 6) Insert the screws which are fixed to the AC choke (**M6x16 DIN-7895H**), tightening pressure of **3N/m**.
- 7) Plug the PCB of trigger thyristors. See figure 7.4.9.



Figure 7.4.10 a

7.4.9. DC BUS

Disassembly of DC Bus

Before proceeding, you should remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7), the pluggable PCB of trigger thyristors (see section 7.4.7), and the power connections board (see figure 7.4.10).

- 1) Disconnect the 2 power cables from the DC bus, with the 2 screws (**M5X12 DIN-7895H**).
- 2) Remove the 4 Phillips screws **M4x8 DIN-7895H** which join the bus and the chassis.
- 3) Remove the DC Bus.



Figure 7.4.12. Disassembly of DC Bus

Assembly of DC Bus

- 1) Put the bus correctly in the chassis, matching the holes.
- 2) Insert the 4 Phillips screws **M4x8 DIN-7895H** that join the bus and the chassis.
- 3) Insert the power connections board (see figure 7.4.11).
- 4) Insert the 2 screws (**M5X12 DIN-7895H**) which join the power connections board and the DC bus.
- 5) Connect the two power cables to the DC bus with screws (**M5X12 DIN-7895H**).

7.4.10. UPPER GATE DRIVE BOARD

Disassembly of the upper Gate Drive board

Before removing the upper Gate Drive board, you should remove the embellishers (see section 7.4.1) and the tray for the boards (see figure 7.4.7).

- 1) Disconnect the flat cable and the phone cables.
- 2) Remove the 8 screws **M3x8 DIN-933**. (See figure 7.4.13).
- 3) Remove *the board*.



Figure 7.4.13. Disassembly of the upper Gate Drive board

Assembly of the upper Gate Drive board

- 1) Put the board in the correct position (see figure 7.4.13).
- 2) Insert the 8 screws **M3x8 DIN-933**.
- 3) Connect the flat cable and the phone cables.

7.4.11. IGBT.

Disassembly of IGBT

Before removing the IGBT's you should remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7) and the upper gate drive board (see section 7.4.10).

See the figure 7.4.13 while following the next instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the output bars which are connected to the power cable of the dV/dt choke, the cable for the IGBT's temperature and the flat cable (see figure 7.4.13 a).
- 3) Remove the screws (**M6x12 DIN-7895H**), which fix the capacitors and the bus bar to the IGBT (see figure 7.4.14 a).
- 4) Remove the 4 screws (**M5X16 DIN-7895H**) which fix the IGBT to the heatsink.
- 5) Remove the IGBT.



Figure 7.4.13 a

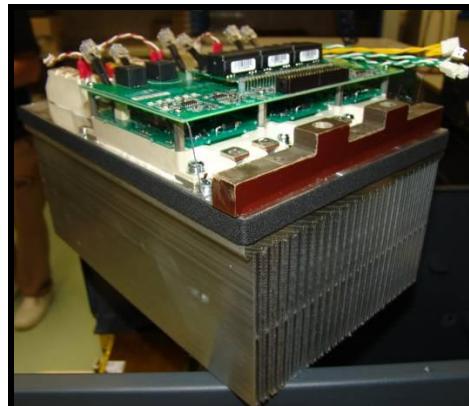


Figure 7.4.14. Disassembly the IGBT.

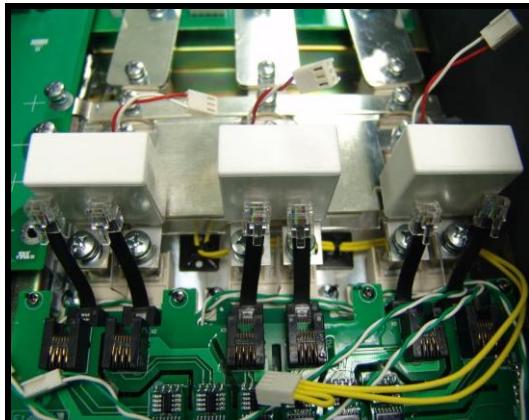


Figure 7.4.14 a.

Assembly of the IGBT

- 1) Continue with the safety conditions which are described in the previous section.
 - 2) Spread the area of the heatsink where the IGBT is going to be placed with new thermal paste.
 - 3) Put the IGBT matching the fixing holes (see figure 7.4.14).
 - 4) Insert the fixing screws for the IGBT (**M5X16 DIN-7895H**) and tighten them at **5 N/m**.
 - 5) Connect the output bars and the capacitors with the bus bar.

7.4.12. CURRENT TRANSFORMERS.

Disassembly of the current transformers

Before removing the transformers, you should remove the embellishers (see section 7.4.1) and the tray boards (figure 7.4.7).

See the figure 7.4.15 while following the next instructions:

- 1) Disconnect the 3 current measurement cables of the transformers and the 3 screws (**M6x16 DIN-7895H**) which connect dV/dt choke to the output.
 - 2) Remove the 6 Phillips screws **M4x8 DIN-7895H** that join the current transformers with the chassis.
 - 3) Remove the current transformers.

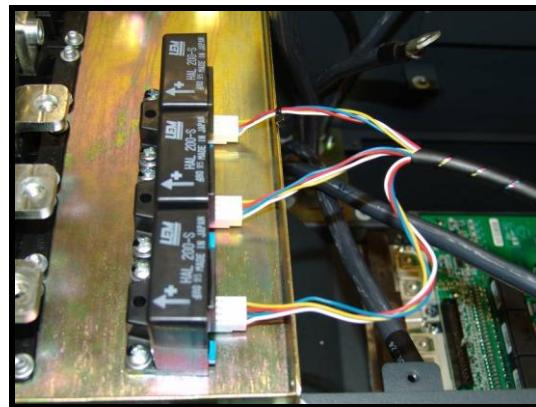


Figure 7.4.15. Disassembly of the current transformers

Assembly of the current transformers

- 1) Insert the Phillips screws **M4x8 DIN-7895H** and fix the transformers to the chassis.
 - 2) Connect the cables of the current transformers.
 - 3) Put the cables of dV/dt chokes on the inside of the transformers and connect them to the output by using 3 screws (**M6x16 DIN-7895H**) and tighten at **5 N/m**.

7.4.13. AC CHOKE.

Disassembly of the AC choke

In order to remove the AC choke, first, you should remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7), the power connections board (see section 7.4.8), the connection bars for the thyristors (see figure 7.4.10 a), the bus bars (see figure 7.4.17 a), the DC bus (see section 7.4.9), and the tray where the connections board is supported (see figure 7.4.16).

See the figure 7.4.17 while following the next instructions:

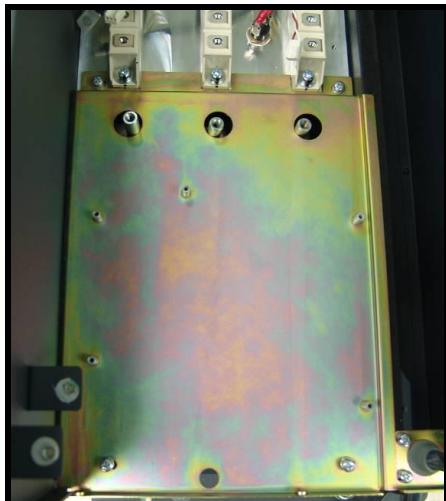


Figure 7.4.16

- 1) It is necessary to remove the power cables in order to remove the AC choke from the drive's chassis. For this, remove the power cables like this (see figure 7.4.17).
- 2) Remove the 4 Phillips screws **M6x20 DIN-7895H** that join the AC choke to the supports of the chassis (see figure 7.4.17).



Figure 7.4.17

- 3) Remove the AC choke (see figure 7.4.18).

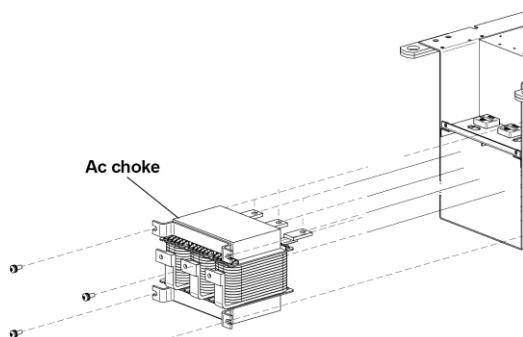


Figure 7.4.18. Disassembly of the AC choke

Assembly of the AC choke

- 1) Insert the AC choke inside the chassis.
- 2) Fix the AC choke to the chassis by using the 4 screws **M6x20 DIN-7895H**.
- 3) Connect the power cables to the choke as the figure 7.4.17 shows.
- 4) Insulate the power cables (see figure 7.4.18).



Figure 7.4.18

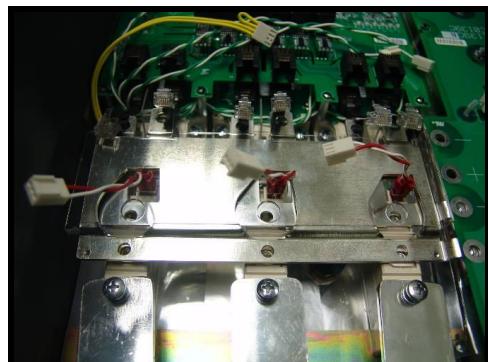


Figure 7.4.17 a.

7.4.14. DV/DT CHOKES

Disassembly of dV/dt chokes

It is necessary to remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7), the power connections board (see section 7.4.8), the connection bars for the thyristors (see figure 7.4.10 a), the bus bars (see figure 7.4.17 a), the DC Bus (see section 7.4.9), the control cable bars (see figure 7.4.21), the bar for connectios (see figure 7.4.19) and the medium bar (see figure 7.4.20).



Figure 7.4.19

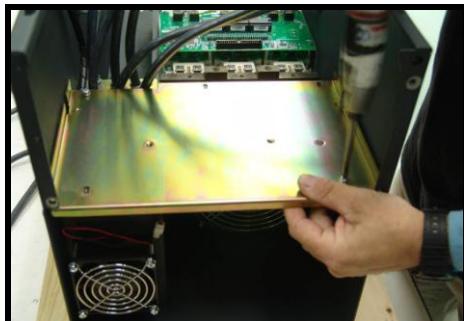
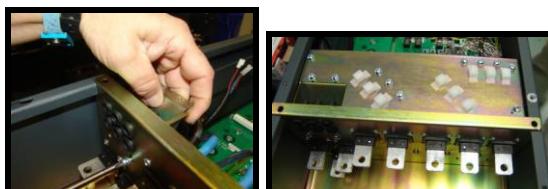


Figure 7.4.20

- 1) Remove the protection bars for the control cables. Figure 7.4.21.



Figures 7.4.21

- 2) Disconnect all cables which are joined to the connections bar and the three cables of dV/dt choke which go to the IGBT (see figure 7.4.22).



Figure 7.4.22

- 3) Remove the 2 screws **M4x8 DIN-7895H** which fix the connections bar to the chassis.
- 4) Remove the connections bar.
- 5) Remove the 5 screws (**M4x8 DIN-7895H**) which fix the medium bar.
- 6) Remove the medium bar.
- 7) Remove the 2 screws (**M4x8 DIN-7895H**) which hold the fixing bar for the fan cables to the chassis (see figure 7.4.23).

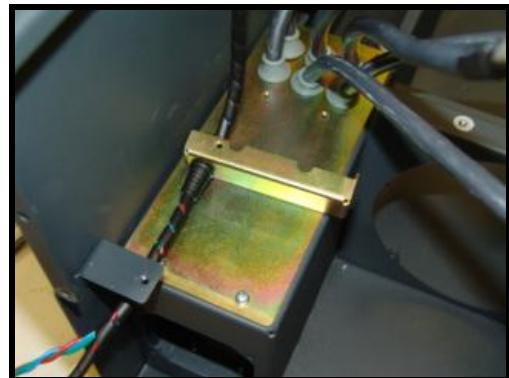


Figure 7.4.23

- 8) Remove the screws which fix dV/dt chokes to the top of the chassis (see figure 7.4.24).



Figure 7.4.24

- 9) Remove the 4 screws (**M4x8 DIN-7895H**) which fix dV/dt chokes to the bottom of the chassis (see figure 7.4.25).



Figure 7.4.25

- 10) Remove *dV/dt* chokes.

Assembly of *dV/dt* chokes

- 1) Put the new *dV/dt* chokes matching their holes and fix them at the bottom by using 4 screws (**M4x8 DIN-7895H**). See figure 7.4.25.
- 2) Fix the upper bar of *dV/dt* chokes with their 4 screws (**M4x8 DIN-7895H**) to the drive's chassis (see figure 7.4.24).
- 3) Hold the fixing bar of the fan cables with their 2 screws (**M4x8 DIN-7895H**) (see figure 7.4.23).
- 4) Fix the medium bar by using 5 screws (**M4x8 DIN-7895H**). See figure 3.20.
- 5) Fix the connections bar with the 2 screws (**M4x8 DIN-7895H**).
- 6) Connect the cables of *dV/dt* choke, the upper cables are connected to the IGBT, and the lower cables are connected to the output in the connections bar.
- 7) Connect the remaining cables of the DC Bus and the power cables coming from the choke.

7.4.15. THYRISTORS

Disassembly of the thyristors

Before removing the thyristors, you should remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7), the connection bars for the thyristors (see figure 7.4.10 a) and the bus bars (see figure 7.4.17 a).

See the figure 7.4.26 while following the next instructions:

- 1) The use of a static grounding wrist strap and being earthed is highly required to repair the unit.
- 2) Disconnect the control cable of the thyristors.
- 3) Remove the Phillips screws **M6x20 DIN-7895H** which join the thyristors and their heatsink.
- 4) Remove the thyristor.

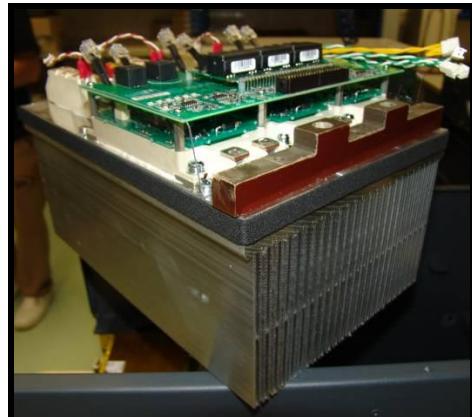


Figure 7.4.26

Restaurar los tiristores

- 1) Take the new thyristors and spread with thermal-conductor paste the bottom of the thyristors.
- 2) Put them over the heatsink, matching the holes of the thyristor with the holes of the heatsink as the figure 7.4.26 shows.
- 3) Insert the Phillips screws **M6x20 DIN-7895H** which join the thyristors with their heatsink.
- 4) Connect the control cables of the thyristors.

7.4.16. FANS

Disassembly of the power heatsink fan

See the figure 7.4.27 while following the next instructions:

- 1) Disconnect the power supply fan of the fan.
- 2) Remove the 2 slotted cheese head screws **M4x60** DIN-84 which join the power fan with the chassis.
- 3) Remove the fan.

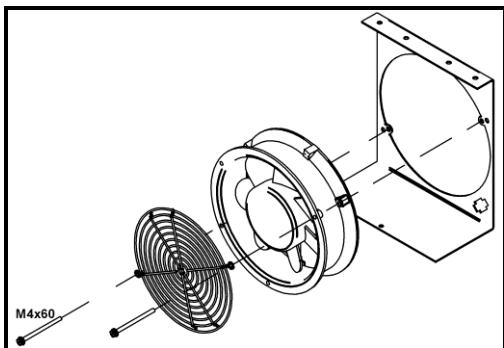


Figure 7.4.27

Assembly of the power heatsink fan

- 1) Put the new fan and fix it with the screws.
- 2) Connect the power supply cable to the fan.

Disassembly of the fan for the toroids

See figure 7.4.28 while following the next instructions:

- 1) Disconnect the power supply cable.
- 2) Remove the 4 slotted cheese head screws **M4x40** DIN-84 which join the fan with the chassis.
- 3) Remove the fan.



Figure 7.4.28

Assembly of the fan for the toroids

- 1) Put the new fan and fix it by using the screws.
- 2) Connect the power fan cable to the fan.

7.4.17. HEATSINK

Disassembly of the heatsink

In order to remove the heatsink, first, you should remove the embellishers (see section 7.4.1), the tray for the boards (see figure 7.4.7), the power connections board (see section 7.4.8), the connection bars for the thyristors (see figure 7.4.10 a), the bus bars (see figure 7.4.17 a), the DC bus (see section 7.4.9), the upper gate drive board (see section 7.4.10), the IGBT's (see section 7.4.11), the thyristors (see section 7.4.15), and the fans (only the fan for the power heatsink) (see section 7.4.16).

- 1) Remove the 2 Phillips screws **M5x12 DIN-7895H** which fix the heatsink to the side of the chassis (see figure 7.4.29).



Figure 7.4.29

- 2) Remove the 2 Phillips screws **M5x12 DIN-7895H** which fix the heatsink by the top (see figure 7.4.30).



Figure 7.4.30

- 3) Remove the heatsink.

Assembly of the heatsink

- 1) Put the new heatsink in the correct position and fix it with their 4 Phillips screws **M5x12 DIN-7895H**.
- 2) Take the thyristors and the lower gate drive board and spread the thermal-conductor paste on the bottom (see figure 7.4.31).
- 3) Follow all the steps described previously in order to insert all the components again.

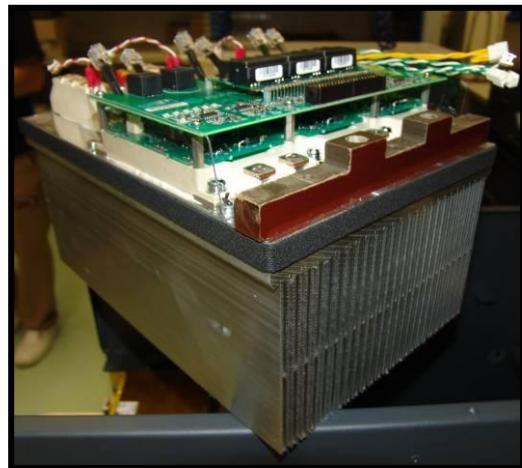


Figure 7.4.31

7.4.18. DISCHARGING RESISTOR

Disassembly of discharging resistor

In order to remove the discharging resistor, first, you should remove the embellishers (see section 7.4.1).

- 1) Remove the 2 screws **M3x6 DIN-7895H** which fix the discharging resistor to the electronic tray (see figure 7.4.32).
- 2) Remove the discharging resistor.



Figure 7.4.32

Assembly of the discharging resistor

- 1) Put the new discharging resistor in the correct position on the electronic tray.
- 2) Fix the discharging resistor to the electronic tray by using the 2 screws **M3x6 DIN-7895H**.

7.4.19. BUS CAPACITORS

Disassembly of the bus capacitors

It is necessary to remove the DC Bus of the drive, before performing this action (see section 7.4.9).

See figure 7.4.33 while following the next instructions:

- 1) Unscrew the 12 special hexagonal screws M5X10 which fix the capacitors to the electronic board of the bus (see figure 7.4.33).
- 2) Remove the electronic board.
- 3) Remove the capacitors which are going to be repaired.

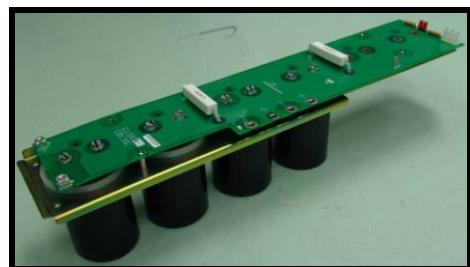


Figure 7.4.33

Assembly of the bus capacitors

- 1) Put the new capacitor on the ring which is inserted in the capacitor support.
- 2) Put the electronic board of the bus and the capacitors in the correct position.
- 3) Insert the screws of the capacitors with a tightening pressure of **3N/m**.

7.5. SD700 FRAME 4.

7.5.1 ACCESS TO THE INTERIOR OF THE DRIVE.

Disassembly of the covers

Follow figure 3.1 and figure 3.2 while reading these instructions:

- 1) Open the SDrive door.
- 2) Disconnect the Display from the Control PCB.
- 3) Disconnect all control terminals (analogue inputs, digital inputs, PTC...)

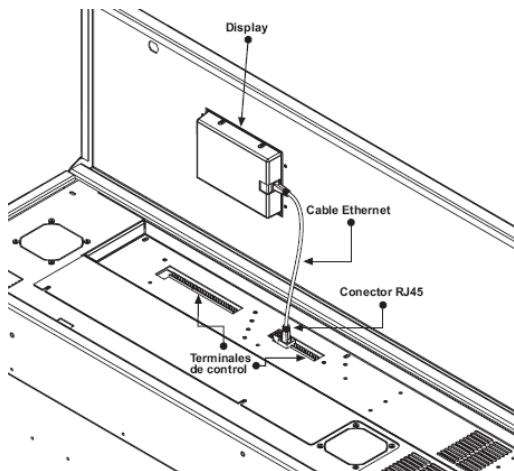


Figure 3.1 Disconnect the Display and the control terminals

- 4) Unscrew the 6 Phillips **M4x8 DIN-7895H** screws, which joins the trims and the SDrive chassis.
- 5) Unscrew the Phillips **M4x12 DIN-7895H** screw, which joins the side of the trim and the Formica piece.
- 6) In IP54 models, disconnect the fan power wires, which are in the trims, before removing them.
- 7) Remove the trims

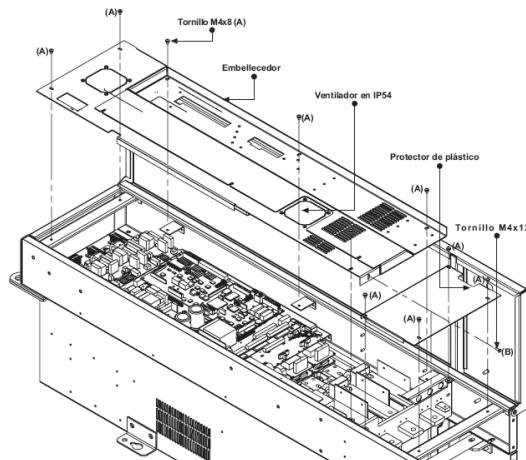


Figure 3.2 Access inside

Assembly of the SD700 trims

- 1) Place the trims over the supports in sides of the chassis as it is shown in the *figure 3.2*.
- 2) Screw the trims to the supports of the side pannels of the chassis with 6 Phillips **M4x8 DIN-7895H**.
- 3) Screw Phillips **M4x12 DIN-7895H**,which joins the side of the trim and the Formica piece.
- 4) Place the plastic protector of the power terminals on the sides of the drive
- 5) Connect all the wiring of the control terminals (analogue inputs, digital inputs, PTC...).
- 6) Connect the Display to the Control PCB through the Ethernet wire.

Disassembly of the plastic protector

- 1) Unscrew the 4 Phillips **M4x8 DIN-7895H**, which join the plastic protector and the Sdrive chassis.
- 2) Remove the plastic protecotr

Assembly of the plastic protector

- 1) Replace the plastic protector of the power terminals in the SDrive chassis by screwing the 4 Phillips **M4x8 DIN-7895H**.

7.5.2 DOOR

Disassembly of the door.

Follow figure 3.3 while reading these instructions:

- 1) Open the door.
- 2) Disconnect the ethernet Display wire.
- 3) Remove the Display of the door.
- 4) Disconnect the earth cable of the door.
- 5) Unscrew the 2 specials screws **M6x12**, which join the door and the chassis.
- 6) Remove the door.

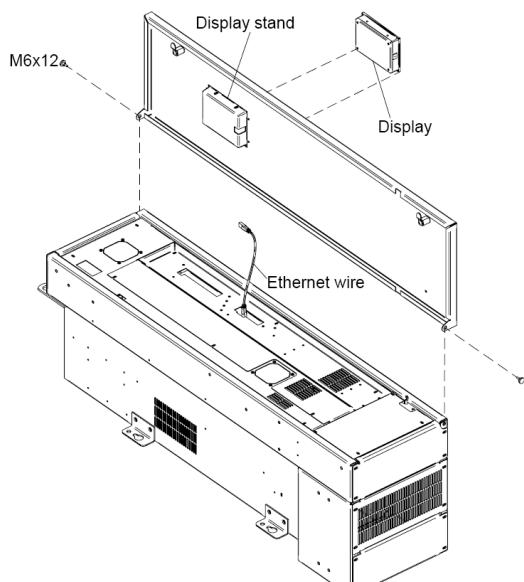


Figure 3.3 Disassembly of the door.

Assembly of the door

- 1) Place the door follow the figure 3.3.
- 2) Join the door and the SD700 chassis by screwing 2 specials screw **M6x12**.
- 3) Place the Display on the door.
- 4) Connect the cable.

7.5.3 UPPER AND LOWER COVERS

Disassembly of the upper and lower covers

Follow figure 3.4 while reading these instructions:

- 1) Unscrew the 6 Phillips **M4x8** DIN-7895H, which join the upper cover and SD700 chassis.
- 2) In IP20 models, remove the upper cover slowly in order to disconnect the fan supply wire.
- 3) Unscrew the 12 Phillips **M5x10** DIN-7895H, which join the 3 lower covers and the SD700 chassis.
- 4) Remove the 3 lower covers.

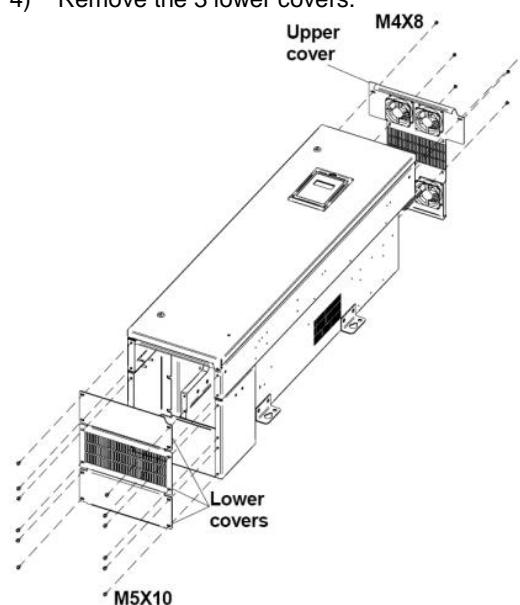


Figure 3.4 Disassembly of the upper and lower covers

Assembly of the upper cover and lower covers

- 1) Screw the 3 lowers covers to the SD700 chassis with 12 Phillips screws **M5x10** DIN-7895H.
- 2) Connect the fan supply wire.
- 3) Join the upper cover and the SD700 chassis with 6 Phillips screws **M4x8** DIN-7895H.

7.5.4 CONTROL BOARD

Disassembly of the Control Board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 3.5 while reading these instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control PCB and the plastic hexagonal spacers **M3x20**.
- 2) Remove the Control Board, remove the 40, 32 y 28 pin connectors, which join the Control Board and the Power Board.
- 3) When the control Board is out, place it in a static proof bag for safekeeping.

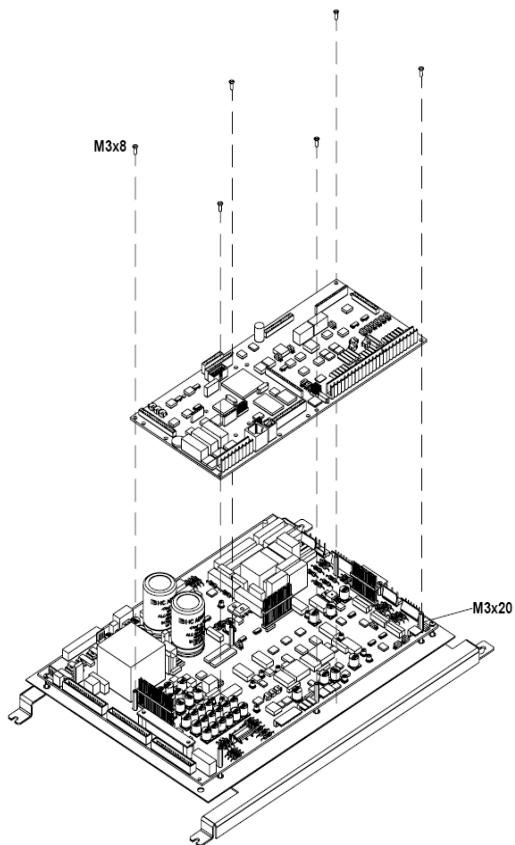


Figure 3.5 Disassembly of the Control Board

Assembly of the Control Board

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new Control PCB.
- 2) Place the new Control Board on the hexagonal spacers **M3x20** and fit the holes. (figure 4.5)
- 3) Push the 40, 32 y 28 pins connectors down. Do not apply force.
- 4) Screw the 6 plastic screws **M3x8** DIN-933 in the plastic hexagonal spacers **M3x20**.

7.5.5 POWER BOARD

Disassembly of the Power board

Before proceeding, the Control Board must have been disassembled (section 7.5.4).

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 3.5 while reading these instructions:

- 1) Disconnect all the wires, which are connected to this Board.

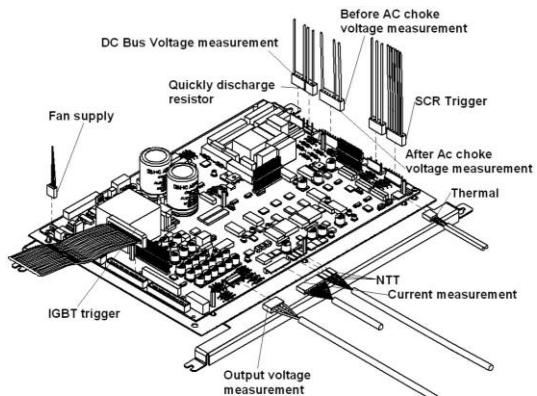


Figure 3.6. Removal of the Power Board wires..

- 2) Remove the 6 plastic hexagonal spacers **M3x20**, which are inserted in the Power Board and held the control board
- 3) Unscrew the 5 Phillips screws **M3x8 DIN-7895H**.
- 4) Remove the power PCB.

Assembly of the Power Board.

Continue to observe static safe work procedures.

- 1) Avoid excessive handling of the new Control Board.
- 2) Place the new power board on the electric tray and fit the board holes in the electric tray bolts. (see figure 7.6)
- 3) Screw the 5 Phillips screws **M3x8 DIN-7895H** in the electric tray bolts.
- 4) Connect the power board wiring. (see figure 7.6)
- 5) Place the plastic hexagonal spacers **M3x20**, on the Power Board in order to insert the Control Board later.

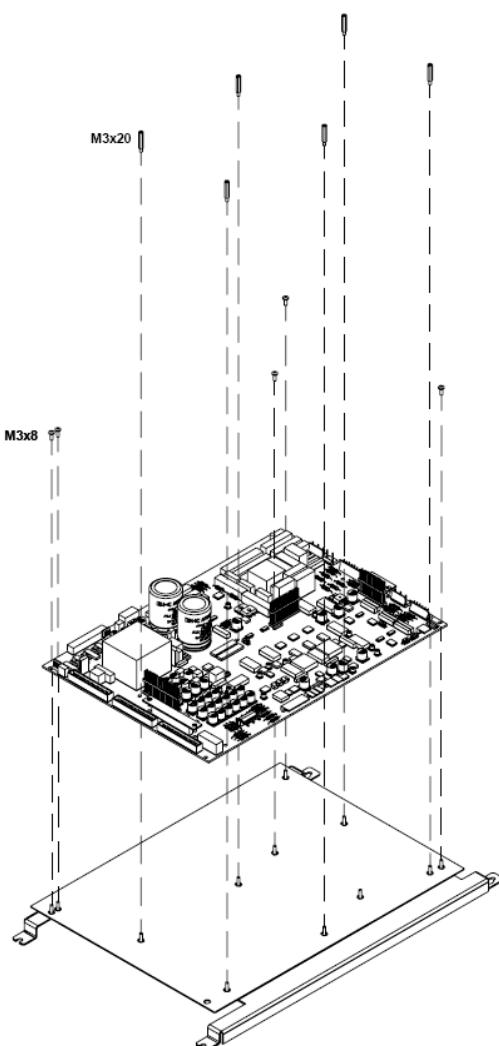


Figure 3.7. Disassembly of the Power Board.

7.5.6 DRIVE SELECT AND IGBT SELECTION MODULE

Disassembly of the Drive Select

Continue to observe static safe work procedures.

Follow figure 3.8 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

Disassembly of the IGBT selection module

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 3.5 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

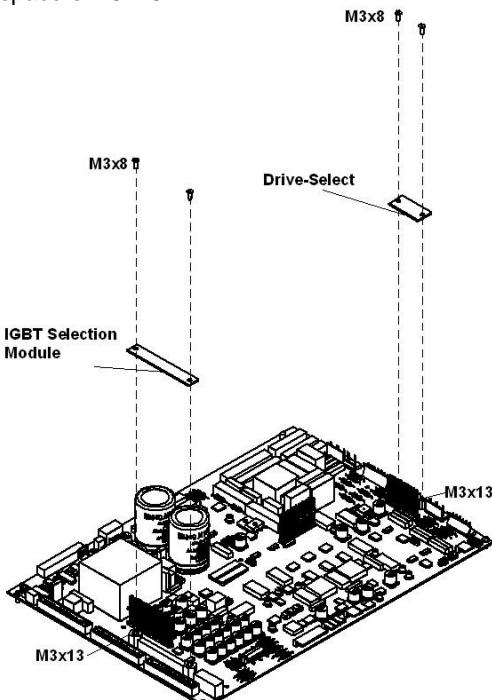


Figure 3.8. Disassembly of the Drive-select and IGBT selection module

Assembly of the Drive Select

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

Assembly of the IGBT selection module

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

7.5.7 SNUBBER, TRIGGER AND SOFT CHARGE PROTECTION BOARD.

Disassembly of the Snubber, trigger and soft charge protection board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 3.9(a), figure 3.9(b) and figure 3.9(c) while reading these instructions:

- 1) Disconnect the voltage measure cable before and after the AC Choke and the earth cable. Afterwards, unscrew the Phillips screws **M4x8** DIN-7895H, which join the wire terminals and the board.

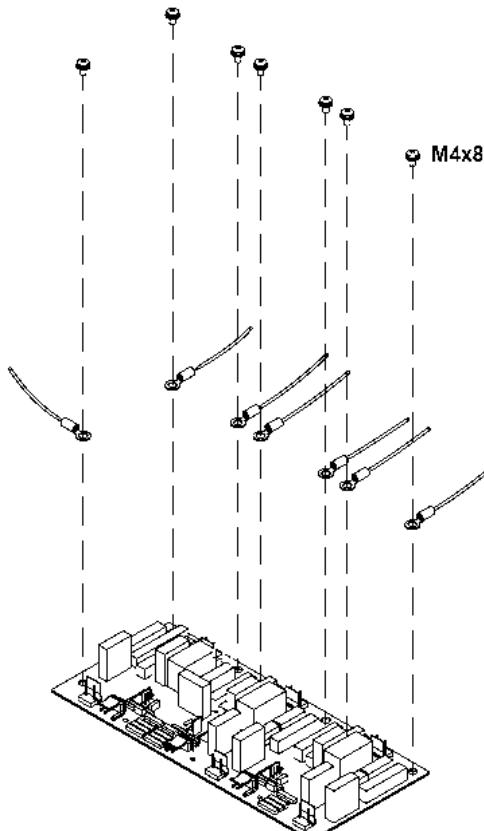


Figure 3.9.(a) Disassembly of the Snubber, Trigger and Soft charge protection

- 2) Disconnect all output wiring (figure 3.9 (b)).
- 3) Unscrew the 3 plastic screws **M3x8** DIN-933, which join the board and the plastic hexagonal spacers **Mix** placed in the Bus(+).
- 4) Unscrew the 3 Phillips screws on **M3x8** DIN-7895H, which join the board and the hexagonal spacers **Mix** placed in the Bus(+).

5) Remove the Board.

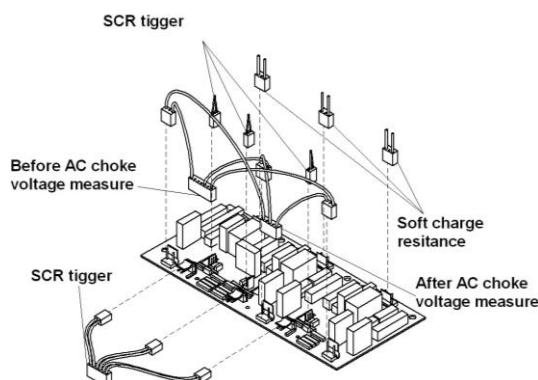


Figure 3.9. (b) Disassembly of the Snubber, Trigger and Soft charge protection

Assembly of the Snubber, trigger and soft charge protection board

Continue to observe static safe work procedures.

- 1) Avoid excessive handling of the new board.
- 2) Place the Board in the position as it is shown in the figure 3.9 (c)
- 3) Screw the 3 plastic screws **M3x8** DIN-933, which join the board and the plastic hexagonal spacers **M3x15**.
- 4) Screw the 3 Phillips screws **M3x8** DIN-7895H, which join this board and the hexagonal spacers **M3x15**.
- 5) Connect all voltage measure cables before and after the AC chokes and the earth cable.
- 6) Connect all output wiring (figure 3.9(b))

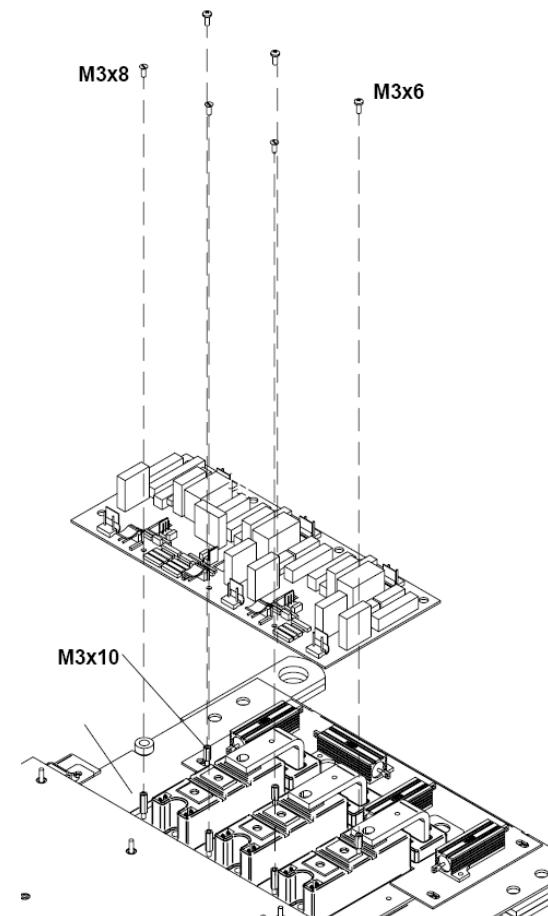


Figure 3.9. (c) Disassembly of the Snubber, Trigger and Soft charge protection

7.5.8 OUTPUT CHOKES.

Disassembly of the output choke

Follow figure 3.10 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M6x20 DIN-7895H**, which join the output choke wire.
- 2) Remove the output choke.

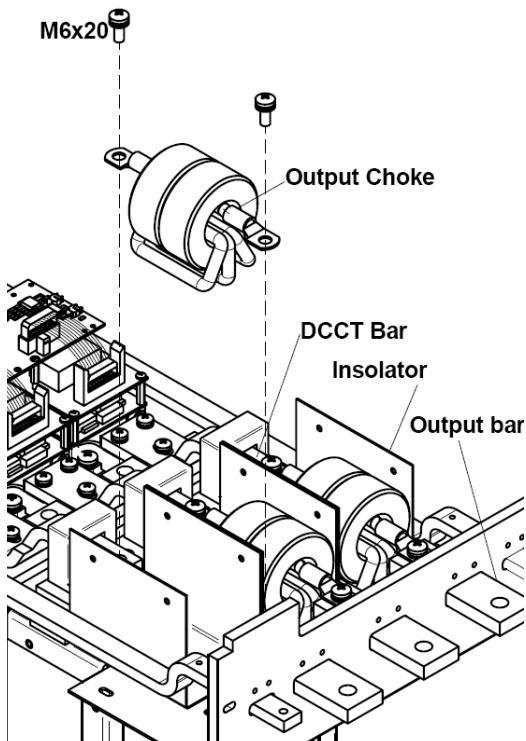


Figure 3.10. Disassembly of the output choke

Assembly of the output choke

- 1) Place the output choke inside the plastic insulator
- 2) Join the terminals of the cables of the output choke to their own busbars by means of 2 Phillips screws **M6x20 DIN-7895H**.

7.5.9 DCCT

Disassembly of the DCCT

Before proceeding, output choke must have been disassembled (section 7.5.8).

Follow figure 3.11 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M4x12 DIN-7895H**, which join the DCCT and the bakelite.
- 2) Remove the DCCT.

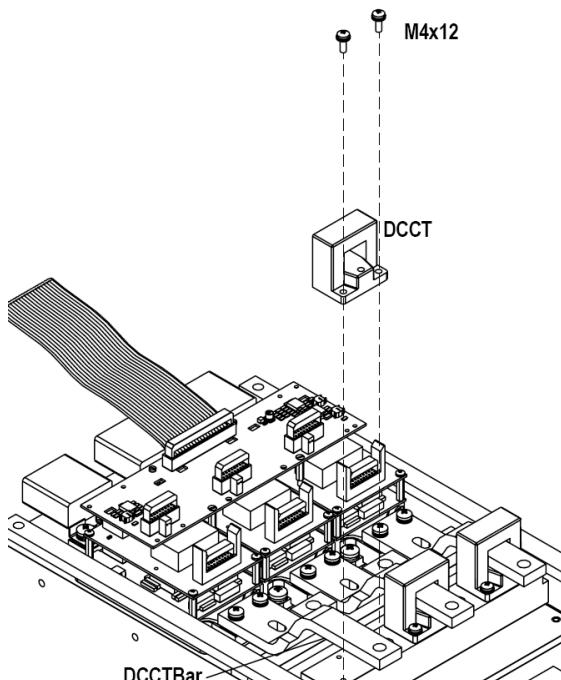


Figure 3.11. Disassembly of the DCCT

Assembly of the DCCT

- 1) Insert the DCCT in the aluminium busbar where it will be placed.
- 2) Join the DCCT to the wood bakelite by screwing 2 Phillips screws **M4x12 DIN-7895H**.

7.5.10 CHASSIS SIDES

Disassembly of the chassis sides

Before proceeding to disassemble the sides, covers (section 7.5.1), the electric tray (section 7.5.5) and the upper and lower covers (section 7.5.2) must have been disassembled.

Follow figure 3.12 while reading these instructions:

- 1) Disassemble the chassis reinforcements.
- 2) Unscrew the 7 hexagonal screws **M8x18** DIN-933, which join the sides and the chassis.
- 3) Disassemble the sides.

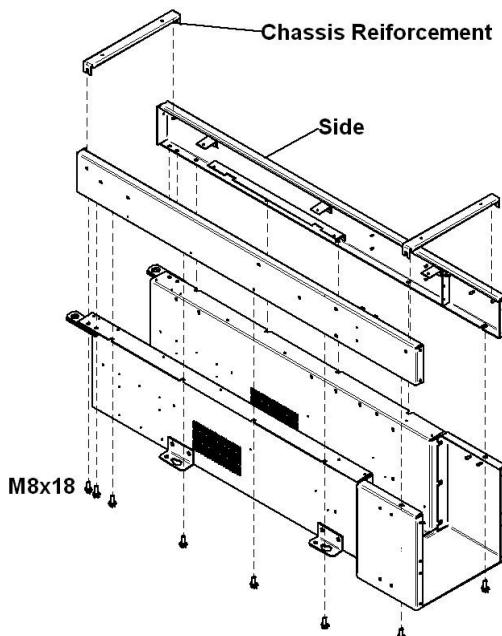


Figure 3.12. Disassembly of the chassis sides

Assembly of the chassis sides

- 1) Place the sides as it is shown in the figure 1.7, so that the holes fit the ones in the chassis.
- 2) Join the sides and the chassis by means of 7 hexagonal screws **M8x18** DIN-933
- 3) Join the chassis reinforcements to the sides by means of 7 hexagonal screws **M8x18** DIN-933

7.5.11. FANS POWER SUPPLY

Disassembly of the fans power supply units

Before proceeding, the chassis side where the fans power supply is inserted must have been disassembled (section 7.5.10).

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 3.12 while reading these instructions:

- 1) Disconnect the 2 fans power supply cables for the fans and the voltage measure cable
- 2) Unscrew the 3 Phillips screws **M3x6** DIN-7895H, which join the fans power supply and the chassis side.
- 3) Remove the fans power supply unit.

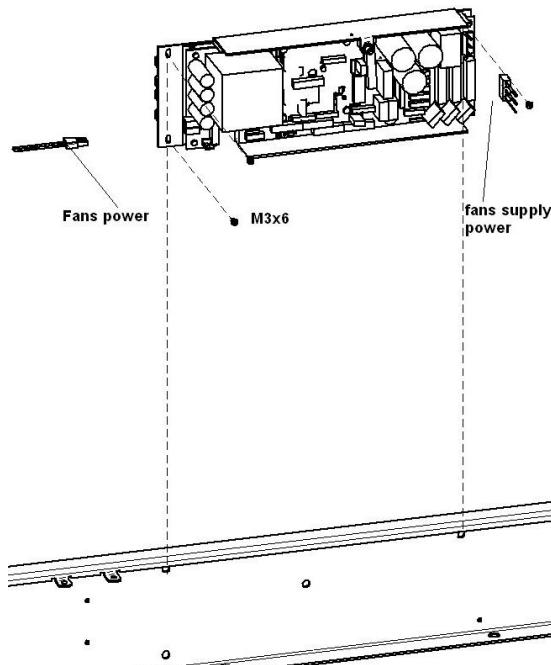


Figure 3.13. Disassembly of the fan power supply unit

Assembly of the fan power supply unit.

Continue to observe static safe work procedures.

- 1) Place the new fans supply power unit in the side of the chassis (figure 3.13)
- 2) Screw 3 Phillips screws **M3x6** DIN-7895H, which join the fan power supply unit and the side of the chassis.
- 3) Connect the 2 fans power supply cables for the fans and the voltage measure cable

7.5.12 OUTPUT BAKELITE.

Disassembly of the output bakelite

Before proceeding, covers (see section 7.5.1) and electric tray (section 7.5.5) must have been disassembled.

Follow figure 3.14 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M6x20** DIN-7895H, which join the Bus output terminals and the DC Bus.
- 2) Unscrew the 4 Phillips screws **M4x18** DIN-7895H, which join the output bakelite and the chassis sides.
- 3) Remove the output bakelite.

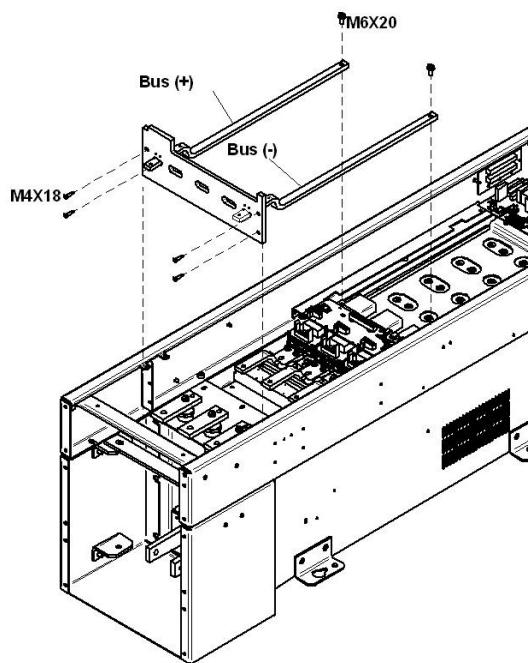


Figure 3.14. Disassembly of the output bakelite

Assembly of the output bakelite

- 1) Place the output bakelite in the SD700 following figure 3.14.
- 2) Screw 4 Phillips screws **M4x18** DIN-7895H, which join the output bakelite to the chassis sides.
- 3) Screw 2 Phillips screws **M6x20** DIN-7895H, which join Bus output terminals and the DC Bus.

7.5.13 DC BUS

Disassembly of the DC Bus

Before proceeding, snubber, trigger and soft charge board (section 7.5.7) and Bus output terminals (section 7.5.12) must have been disassembled.

Follow figure 3.15 (a), figure 3.15 (b) and figure 3.15 (c) while reading these instructions:

- 1) Remove the electronic tray, where the Control Board and Power Board are inserted, by unscrewing the 4 Phillips screws **M4x8** DIN-7895H, which join this tray and the chassis sides.

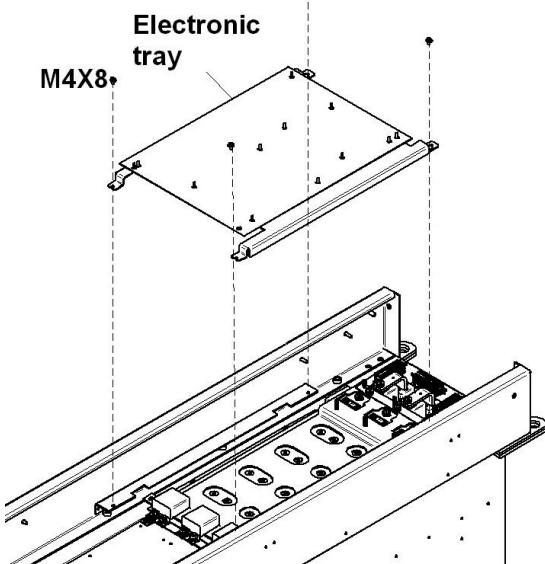


Figure 3.15. Disassembly of the DC Bus (a)

- 2) Disassembled the Snubber capacitors by unscrewing the Phillips screws **M6x12** DIN-7895H, which join the snubbers capacitors and the DC Bus.
- 3) Remove the plastic hexagonal spacers **Mix3x10**, which are inserted in the DC bus (+) and where the Snubber PCB leans
- 4) Remove the plastic hexagonal spacers **Mix3x15**, which are inserted in the DC bus (+) and where the Snubber PCB leans

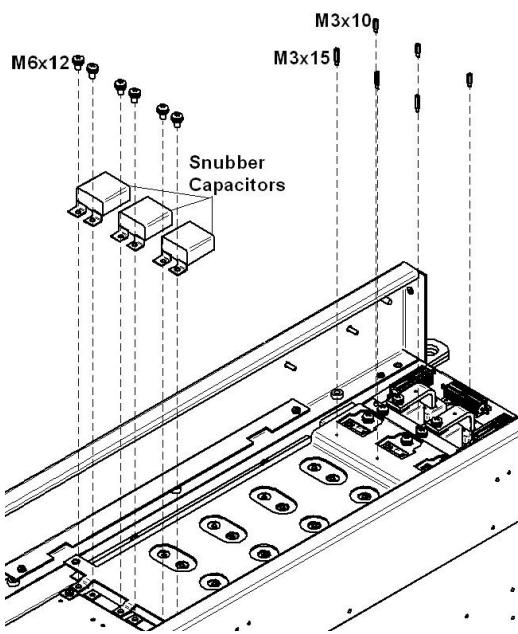


Figure 3.15. Disassembly of the DC Bus (b)

- 5) Disassemble one chassis side (section 7.5.10).
- 6) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger.
- 7) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the chassis.
- 8) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger.
- 9) Unscrew the 6 Phillips screws **M6x12 DIN-7895H**, which join the Bus(+) and the Bus(-) and the 3 SCRs.

Assembly of the DC Bus

- 1) Place the DC Bus on the chassis.
- 2) Screw 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger .
- 3) Screw 2 Phillips screws **M4x8 DIN-7895H**
- 4) Screw 6 Phillips screws **M6x12 DIN-7895H** which, join the DC Bus and the SCRs.

- 5) Screw 4 Phillips screws **M4x8 DIN-7895H** , which join the DC Bus and the SCRs heat exchanger.

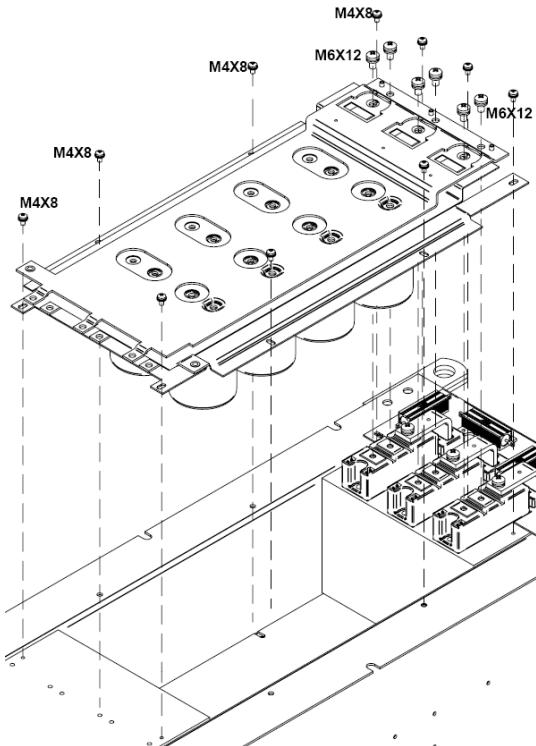


Figure 3.15. Disassembly of the DC Bus (c)

- 6) Insert the plastic hexagonal spacers **Mix** on the DC Bus where the snubber, trigger and soft charge PCB leans.
- 7) Insert the plastic hexagonal spacers **M3x15** on the DC Bus, where the snubber, trigger and soft charge PCB leans.
- 8) Place the snubbers capacitors on the back part of DC Bus (figure 3.15) by screwing the Phillips screws **M6x12 DIN-7895H** .
- 9) Insert the chassis side (section 7.5.10).
- 10) Insert the electronic tray, where the Power and Control Board are inserted, by means of 4 Phillips screws **M4x8 DIN-7895H** .

7.5.14 BUS CAPACITORS

Disassembly of the Bus capacitors

Before proceeding, the DC Bus must have been disassembled. (section 7.5.13).

Follow *figure 3.16* while reading these instructions:

- 1) Unscrew the special hexagonal screws **M5x20**, which join the capacitor and the Bus(+)
- 2) Remove the Bus(+).
- 3) Remove the Bus(+) and Bus(-) insulator.
- 4) Unscrew the special hexagonal screws **M5x20**, which join the capacitors and the Bus (-)
- 5) Remove the Bus (-).
- 6) Remove the Bus(-) and the middle Bus insulator.
- 7) Unscrew the special hexagonal screws **M5x20**, which join the middle Bus and the capacitors.
- 8) Dissassemble the middle Bus.
- 9) Take out the capacitors of their rings.

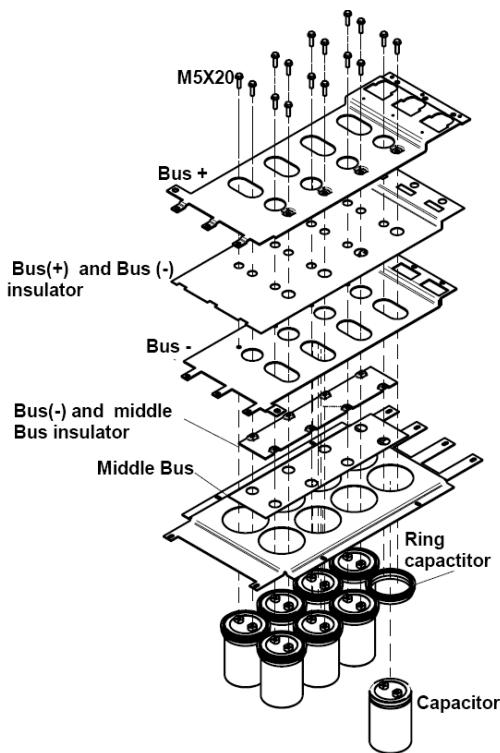


Figure 3.16. Disassembly of the Bus capacitors

Assembly of the Bus capacitors

- 1) Place the new capacitors in their rings.
- 2) Insert the middle Bus (*figure 3.16*).
- 3) Screw the special hexagonal screws **M5x20**.
- 4) Insert the Bus(-) and the middle Bus insulator.
- 5) Insert the Bus (-) (*figure 3.16*).
- 6) Screw special hexagonal screws **M5x20** which join with Bus (-) to the capacitors.
- 7) Place the Bus (+) and Bus (-) insulator.
- 8) Insert the Bus (+) (*figure 3.16*).
- 9) Screw special hexagonal screws **M5x20** , which join with Bus (+) to the capacitors.

7.5.15 IGBTs CONNECTOR BOARD

Disassembly of the IGBTs connector board.

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 3.17* while reading these instructions:

- 1) Disconnect the IGBT trigger cable, which connects this board to the Power board.
- 2) Disconnect the 3 NTC wires, which connect this board to the Upper Gate Drive.
- 3) Unscrew the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 4) Unscrew the 2 slotted cheese head screws **M3x30** DIN-84, which join this Board and the Upper Gate Drives.
- 5) Remove the IGBTs connector board. The plastic hexagonal spacers and the Nylon cases are not fixed anywhere, They are simply holding this board, so that take care not to lose them when the board is disassembled.

Assembly of the IGBTs connector board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the new board on the plastic hexagonal spacers **M3x18** and the Nylon cases.
- 3) Screw 2 slotted cheese head screws **M3x30** DIN-84, which fit into the Nylon cases and are joined to the hexagonal spacers **M3x18**, located under the upper Gate Drive.
- 4) Screw 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 5) Connect the GBT trigger cable.
- 6) Connect the NTC cables.

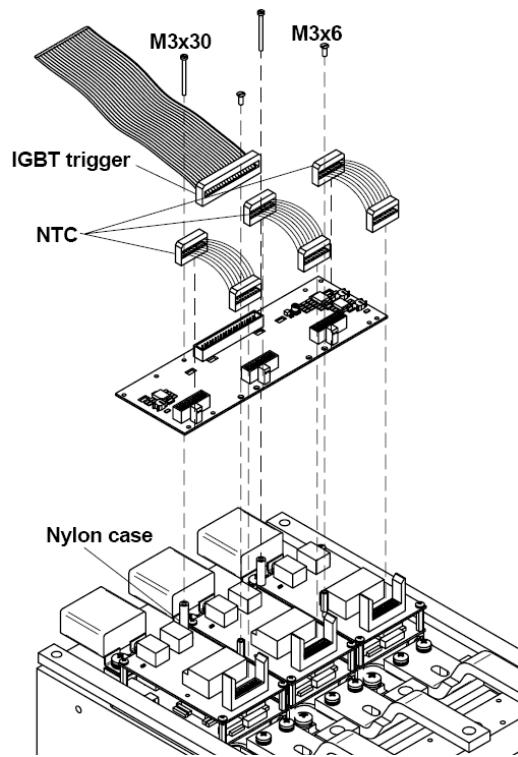


Figure 3.17. Disassembly of the IGBT Connector Board

7.5.16 UPPER GATE DRIVE

Disassembly of the upper Gate Drive

Before proceeding, the IGBTs connector board must have been disassembled. (section 7.5.15).

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 3.18* while reading these instructions:

- 1) Disconnect the phone wires, which connect this board to the lower Gate Drive.
- 2) Unscrew the Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 3) Remove the upper Gate Drive.

Assembly of the upper Gate Drive

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board
- 2) Place the new board on the hexagonal spacers **M3x18**. (*figure 3.18*).
- 3) Screw 3 Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 4) Connect the phone cables.

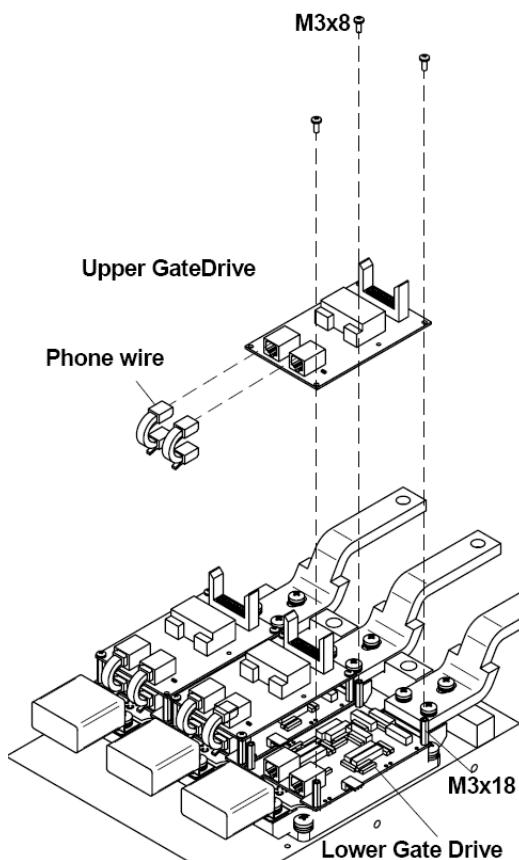


Figure 3.18.Assembly of the upper GateDrive

7.5.17. IGBT

Disassembly of the IGBT

Before proceeding, the upper Gate Drive board must have been disassembled. (section 7.5.17)

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 3.19 (a)* and *figure 3.19 (b)* while reading these instructions :

- 1) Unscrew the 4 hexagonal spacers **M3x18**, where the upper Gate Drive is inserted.
- 2) Unscrew the 2 Phillips screws **M6x12** DIN-7895H, which join the Snubber capacitors and the IGBTs.
- 3) Remove the DC Bus (section 7.5.12)
- 4) Remove the snubber capacitors

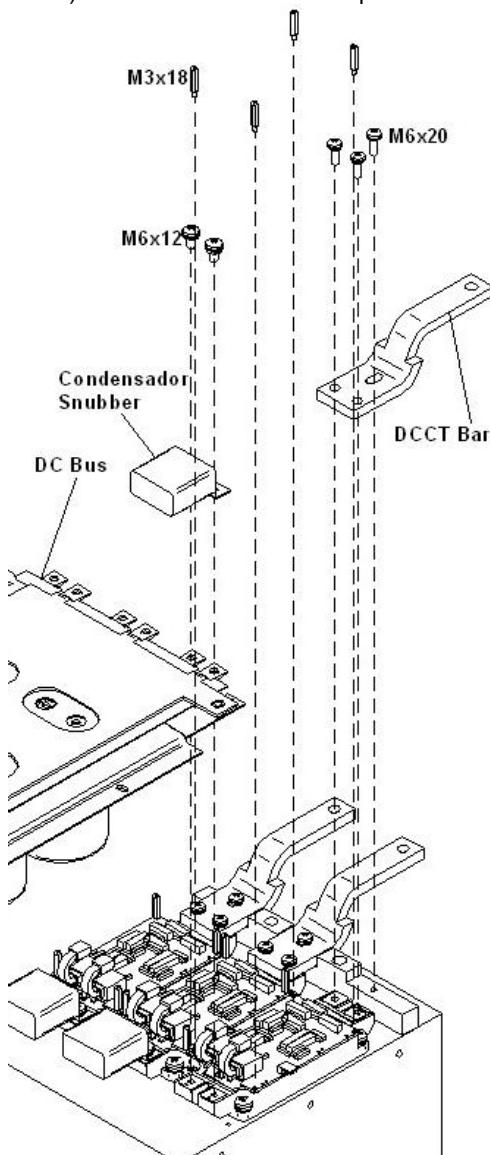


Figure 3.19. Disassembly of the IGBT(a)

- 5) Unscrew the 3 Phillips screws **M6x20** DIN-7895H, which join the IGBT and the bar where DCCTs are inserted.
- 6) Remove the bar where DCCTs are screwed.
- 7) Unscrew the 4 Phillips screws **M5x16** DIN-7895H, which join the IGBT and the heat exchanger.
- 8) Remove the IGBT.

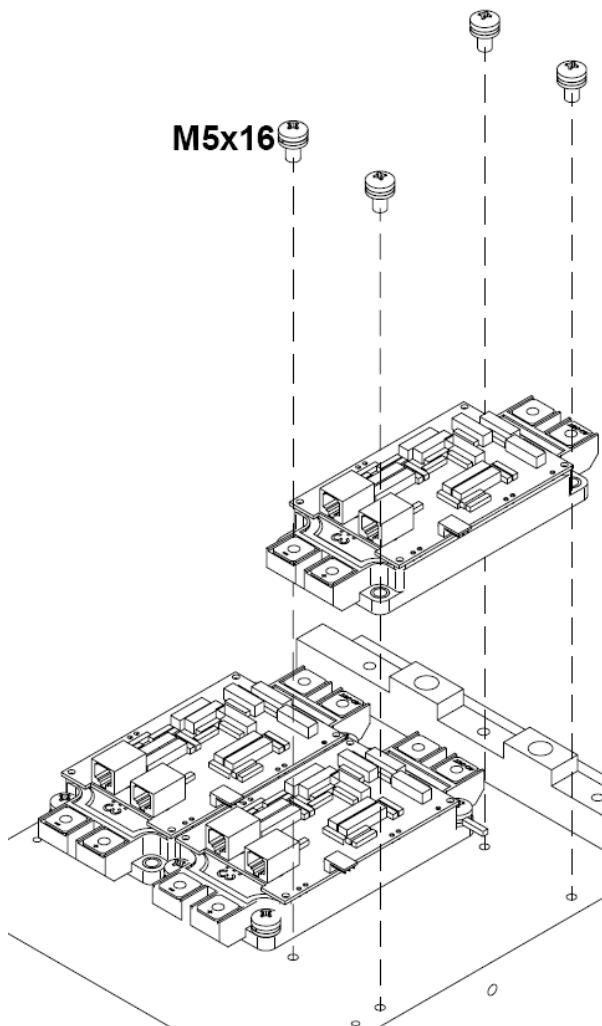


Figure 3.19. Disassembly of the IGBT (b)

Assembly of the IGBT

Continue to observe static safe work procedures.

- 1) Avoid excessive handling of the new board.
- 2) Take out the new IGBT from the static box .

- 3) Spread the thermal paste over the back of the IGBT
- 4) Place the IGBT on the heat exchanger.
- 5) Screw the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 6) Place the DCCT Bar as it is shown in *figure 3.19*.
- 7) Screw the 3 Phillips screws **M6x20 DIN-7895H**, which joint the DCCT bar and the IGBT.
- 8) Insert the DC Bus (*section 7.5.12*).
- 9) Put the Snubber capacitor on the DC Bus.
- 10) Screw the 2 Phillips screws **M6x12 DIN-7895H**, which join the snubber capacitors and the IGBTs.
- 11) Screw the 4 hexagonal spacers **M3x18**, where the Upper Gate Drive is inserted.
- 12) Connect the phone cables.

7.5.18. SOFT CHARGE AND QUICK-DISCHARGE RESISTORS.

Disassembly of the soft charge and quick-discharge resistors.

Before proceeding, the upper cover (*section 7.5.3*),the snubber trigger and the soft charge board (*section 7.5.7*), and the DC Bus (*section 7.5.13*) must have been disassembled.

Follow *figure 3.20* while reading these instructions:

- 1) Unscrew the Phillips screws **M6x16 DIN-7895H**, which join the bars and the SCRs.
- 2) Unscrew the Phillips screws **M6x20 DIN-7895H**, which join the bars and the AC Choke.
- 3) Remove all voltage measure cables after the the AC chokes by unscrewing the Phillips screws **M4x8 DIN-7895H** , which join these wires and the bars.
- 4) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the resistors support and the chassis.
- 5) Remove the resistors.

Assembly of the soft charge and quick-discharge resistors.

- 1) Insert the resistors support in the chassis.
- 2) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the resistors support and the chassis.
- 3) Insert the bars (*figure 20*).
- 4) Insert all voltage measure cables after the AC chokes by screwing the Phillips screws **M4x8 DIN-7895H**, which join these wires and the bars.
- 5) Screw the Phillips screws **M6x20 DIN-7895H**, which join the bars and the AC Choke.
- 6) Screw the Phillips screws **M6x16 DIN-7895H**, which join the bars and the SCRs.

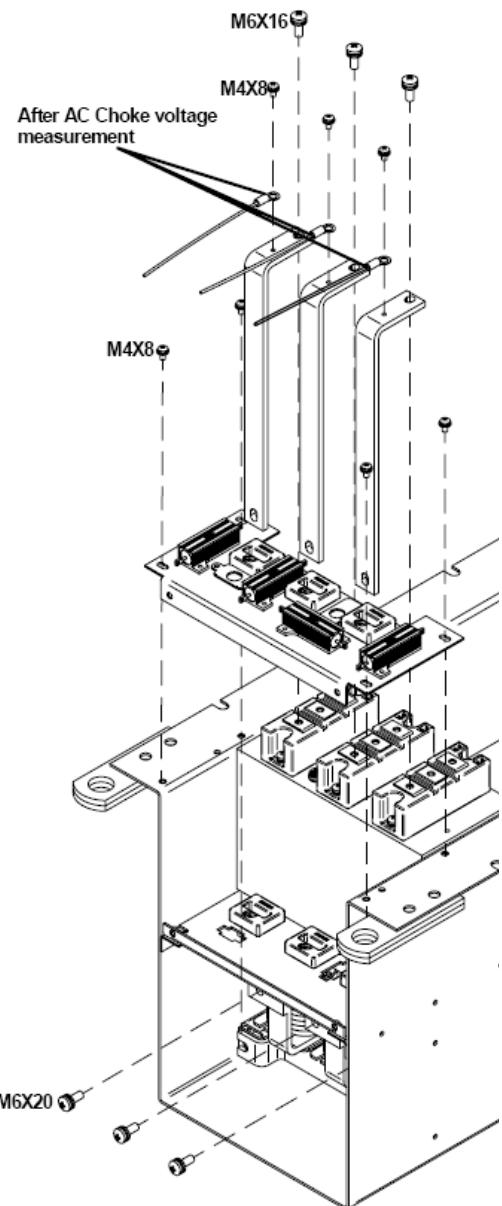


Figure 3.20. Assembly of the soft charge and quick-discharge resistors.

7.5.19 SCRs

Disassembly of the SCRs

Before proceeding, the bars, which join the AC choke and the SCRs must have been disassembled (section 7.5.18)

Follow *figure 3.21* while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M5x12 DIN-7895H**, which join the SCR with the heat exchanger.
- 2) Remove the SCR.

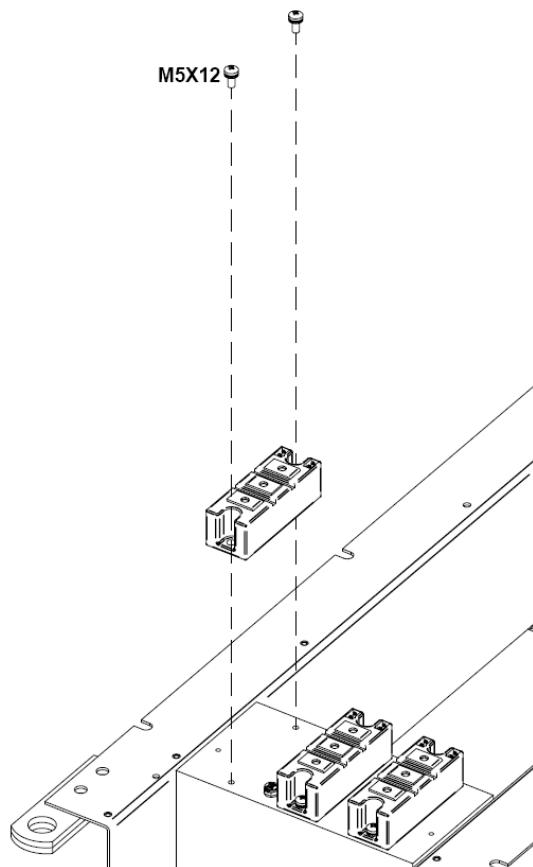


Figure 3.21. Removing SCR

Disassembly of the SCRs

- 1) Spread the thermal paste over the lower side of the new SCR.
- 2) Insert the SCR in the heat exchanger (see *figure 3.21*).
- 3) Screw the 2 Phillips screws **M5x12 DIN-7895H**, which join the SCR and the heat exchanger.

7.5.20 POWER FAN.

Disassembly of the Fan support

Follow *figure 3.22* while reading these instructions:

- 1) Unscrew the Phillips screw **M4x8 DIN-7895H**, which join the fan support and the fan box.
- 2) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Disconnect the fan power cable.
- 4) Remove the fan support.

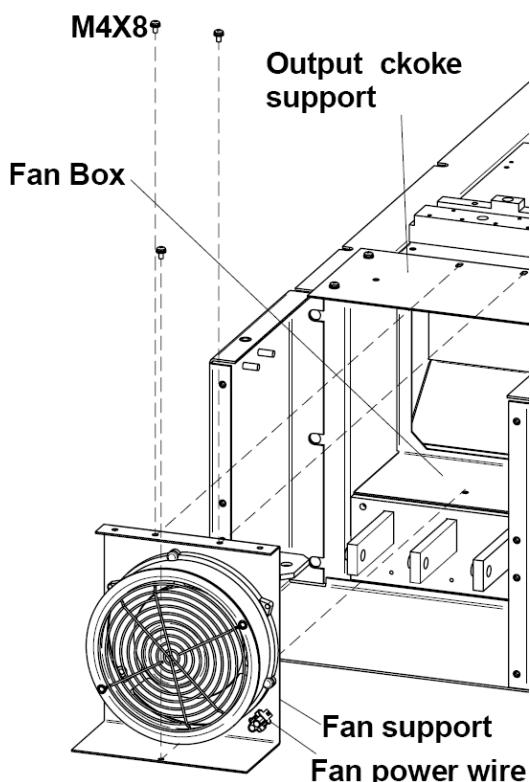


Figure 3.22. Disassembly of the fan support

Disassembly of the fan support

24VDC, 2A, 48W, 172X172 FAN

Follow *figure 3.23(a)* while reading these instructions:

Unscrew the 2 slotted cheese head screws **M4x60 DIN-84**, which join the power fan and its support.

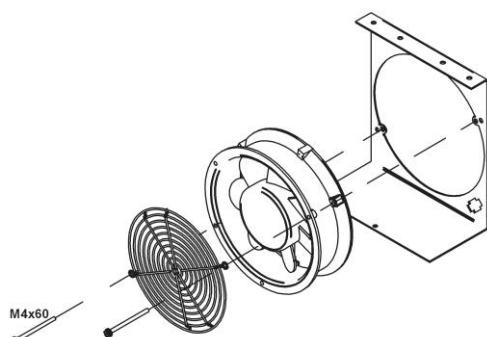


Figure 7.23 (a) .Disassambly of the fan support

24VDC, 89W, 172X172 FAN

Follow *figure 3.23(a)* while reading these instructions:

Unscrew the 2 Phillips screws **M4x12 DIN-7895H** which join the power fan with its support.

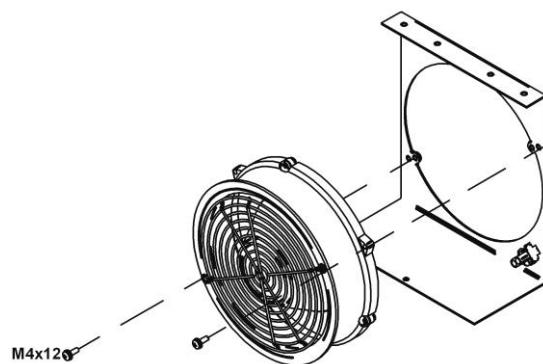


Figure 3.23 (b) . Removing fan support

Assembly of the Fan power support

- 1) Before inserting the fan support in the fan box, connect the fan power wire, and then insert the fan support in the fan box.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Screw Phillips screw **M4x8 DIN-7895H**, which join the fan support with fan box.

7.5.21 AC CHOKE

Disassembly of the AC Choke

Before proceeding, the bars which join the AC choke and the SCRs (section 7.5.18) and the upper cover (section 7.5.3) must have been disassembled.

Follow *figure 3.24* while reading these instructions:

- 1) Disconnect the power wires to the input terminals, because the wires are not long enough to remove the AC choke.
- 2) Unscrew the 4 Phillips screws **M6x16 DIN-7895H**, which join the AC choke and the chassis.
- 3) Take the AC choke out of the chassis, and disconnect the 3 power wires by unscrewing the hexagonal screws **M8x25 DIN-961**, which join the power wires and the AC choke.
- 4) Remove the AC choke.

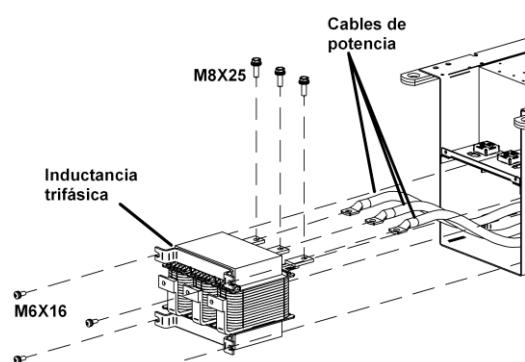


Figure 3.24 . Disassembly of the AC choke

Assembly of the AC choke

- 1) Bring near the AC choke to the chassis and connect the power wires by screwing the hexagonal screws **M8x25 DIN-961**.
- 2) Insert the AC choke in the chassis and screw the 4 Phillips screws **M6x16 DIN-7895H**, which join the AC choke and the chassis.

7.5.22 HEAT EXCHANGERS

Disassembly of the heat exchangers

Before proceeding, SCRs (section 7.5.19) and IGBTs (section 7.5.17) must have been disassembled.

Follow *figure 3.25* while reading these instructions:

- 1) Disconnect the thermal wire of SCRs heat exchanger.
- 2) Unscrew the 4 Phillips screws **M6x16 DIN-7895H**, which join SCRs heat exchanger and the chassis.
- 3) Remove the SCRs heat exchanger.
- 4) Unscrew the 2 Phillips screws **M5x16 DIN-7895H**, which join the output IGBTs bakelite and the IGBTs heat exchanger.
- 5) Remove the output IGBTs bakelite.
- 6) Unscrew the 6 Phillips screws **M6x16 DIN-7895H**, which join IGBTs heat exchanger and the chassis.
- 7) Remove the IGBTs heat exchanger.

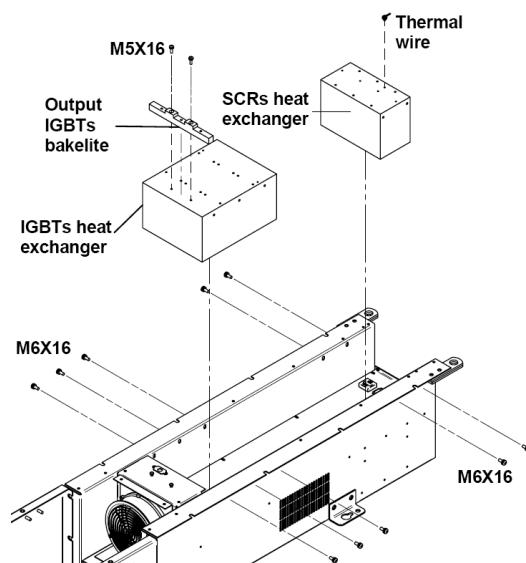


Figure 3.25 .Disassembly of the heat exchangers.

7.6. SD700 FRAME 5.

7.6.1 ACCESS INSIDE.

Disassembly of the covers

Follow figure 4.1 and figure 4.2 while reading these instructions:

- 1) Open the SDrive door.
- 2) Disconnect the Display from the Control PCB.
- 3) Disconnect all control terminals (analogue inputs, digital inputs, PTC...)

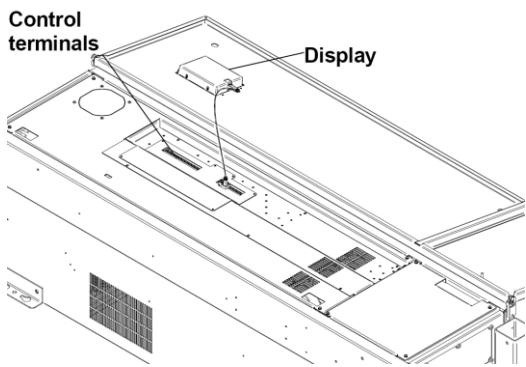


Figure 4.1 Disconnect the Display and the control terminals

- 4) Unscrew the 2 Phillips screws **M4x12** DIN-7895H, which join the cover and the upper part of the chassis.
- 5) Unscrew the 2 Phillips screws **M4x8** DIN-7895H, which joint the cover and the lower part of the chassis
- 6) In IP54 models, disconnect the fan power wires, which are in the covers before disassembling them
- 9) Remove the covers

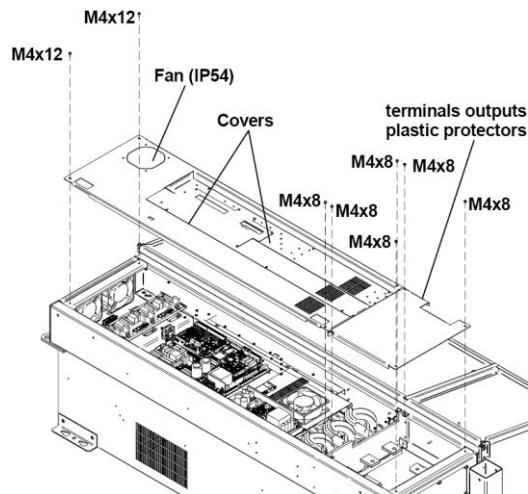


Figure 4.2 Removal of the covers

Assembly of the SD700 Covers

- 1) Place the covers on the chassis as it is shown in figure 4.2.
- 2) In IP54 models, connect the fan power wires, which are in the covers before placing them.
- 3) Screw the 2 Phillips screws **M4x12** DIN-7895H, which join the covers and the upper part of the chassis.
- 4) Screw the 2 Phillips screws **M4x8** DIN-7895H, which join the covers and lower part of the chassis.
- 5) Connect control terminals (analogue inputs, digital inputs, PTC...).
- 6) Connect the Display to the Control PCB.

Removal of the plastic protector

- 1) Unscrew the 4 Phillips **M4x8** DIN-7895-H, which join the plastic protector and the SDrive chassis.
- 2) Remove the plastic protector.

Assembly of the plastic protector

- 1) Place the power terminals plastic protector on the SDrive chassis by screwing 4 Phillips **M4x8** DIN-7895H.

7.6.2 UPPER COVER.

Disassembly of the upper cover

Follow *Figure 4.4* while reading these instructions:

- 1) Unscrew the 6 Phillips **M4x8** DIN-7895H, which join the upper cover and the SD700 chassis.
- 2) In IP20 models, before removing the upper covers The fans supply wire must have been disconnected Therefore, separate some the upper cover from the chassis, disconnect the wire and then remove the upper cover.

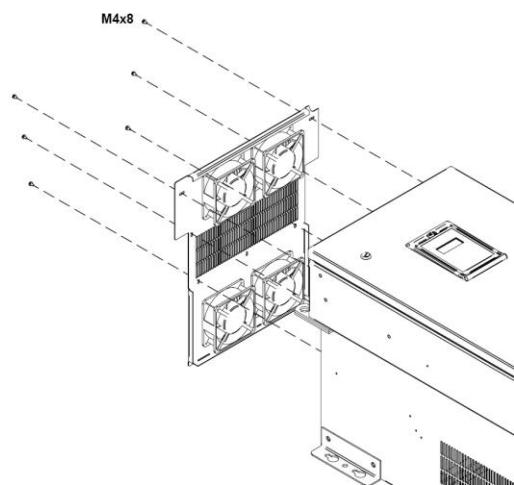


Figure 4.3 Removal of the upper covers

Assembly of the upper cover

- 1) In IP20 models, connect the fans supply wire.
- 2) Join the upper cover and the SD700 chassis by screwing the 6 Phillips screw **M4x8** DIN-7895H.

7.6.3 CONTROL BOARD

Disassembly of the Control Board

The use of a static grounding wrist strap and being earthed is highly required.

Follow *Figure 4.4* while reading these instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control PCB and the plastic hexagonal spacers **M3x20**.
- 2) Remove the Control Board by disconnecting the 40, 32 y 28 pin connectors, which join the Control Board and the Power Board.
- 3) When the control Board has been already disassembled, place it in a static proof bag for safekeeping.

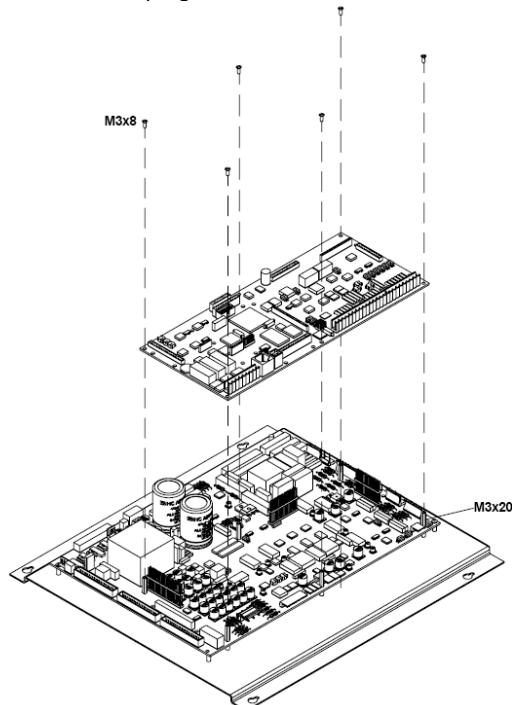


Figure 4.4 Disassembly of the Control Board

Assembly of the Control Board

Continue to observe static safe work procedures.

- 1) Avoid excessive handling of the new Control Board.
- 2) Place the new Control Board on the hexagonal spacers **M3x20**, (*figure 4.5*)
- 3) Push down the 40, 32 y 28 pin connectors till they fit in the connectors of the Power Board. Do not apply force.
- 4) Screw the 6 plastic screws **M3x8** DIN-933 in the plastic hexagonal spacers **M3x20**.

7.6.4 POWER BOARD

Disassembly of the Power board

Before proceeding, the Control Board must have been removed (*section 7.6.3*).

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 4.5* while reading these instructions:

- 1) Disconnect all the wires, which are connected in this Board.

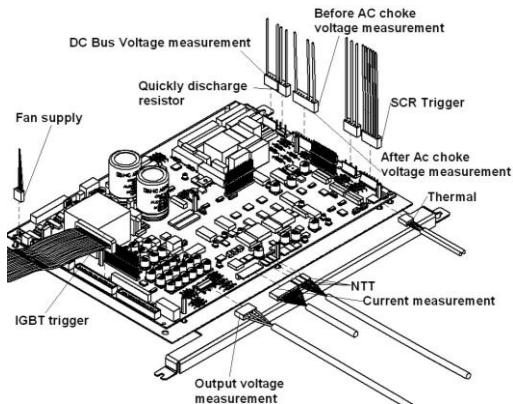


Figure 4.5. Disconnection of all Power Board wires..

- 2) Remove the 6 plastic hexagonal spacers **M3x20** inserted in the Power Board.
- 3) Unscrew the 5 Phillips screws **M3x8 DIN-7895H**.
- 4) Disassemble the Power Board.

Assembly of the Power Board.

Continue to observe static safe work procedures.

- 1) Avoid excessive handling of the new Power PCB.
- 2) Place the new Power Board on the electric tray and fit the holes in the electric tray bolts. (*figure 7.6*)
- 3) Screw the 5 Phillips screws **M3x8 DIN-7895H** on the electric tray bolts.
- 4) Connect the Power Board wiring (*figure 7.6*).
- 5) Place the plastic hexagonal spacers **M3x20** on the Power Board, so that the Control Board can be inserted later.

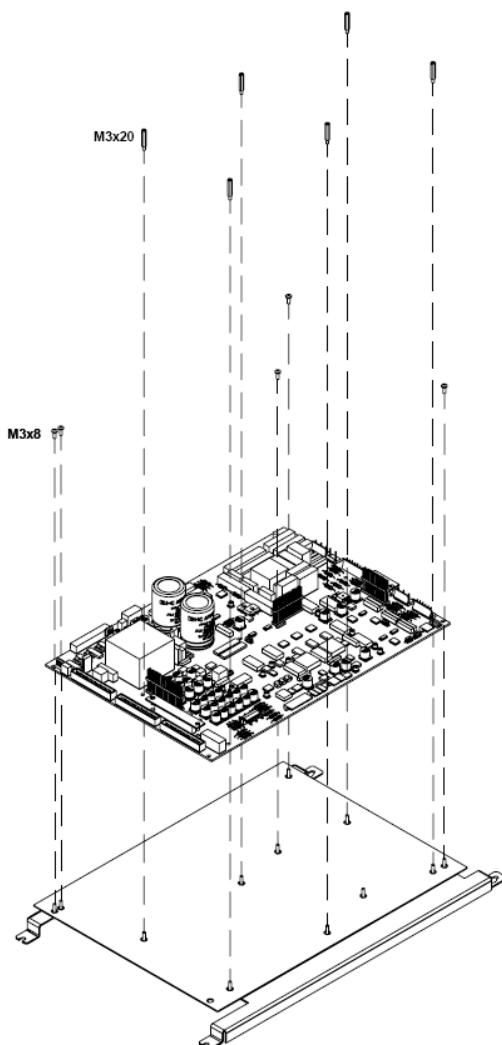


Figure 4.6. Disassembly of the Power Board.

7.6.5 DRIVE SELECT AND IGBT SELECTION MODULE

Disassembly the Drive Select

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 4.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

Disassembly of the IGBT selection module

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 4.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

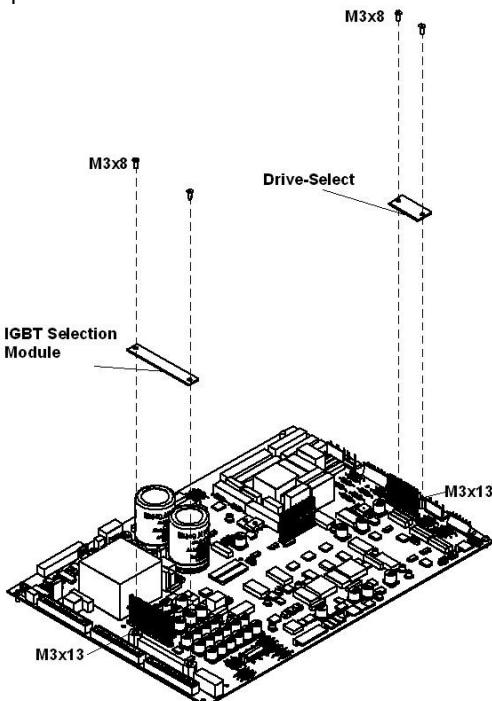


Figure 4.7. Remove Drive-select and IGBT selection module

Assembly of the Drive Select

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

Assembly of the IGBT selection module

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

7.6.6 SNUBBER, TRIGGER AND SOFT CHARGE PROTECTION BOARD

Disassembly of the Snubber, trigger and soft charge protection board

Follow figure 4.8 (a), figure 4.8 (b) and figure 4.8 (c) while reading these instructions:

- 1) Disconnect the voltage measure cable before and after the AC chokes by the Phillips screws **M4x8** DIN-7895H, which join the cable terminals and the Board.

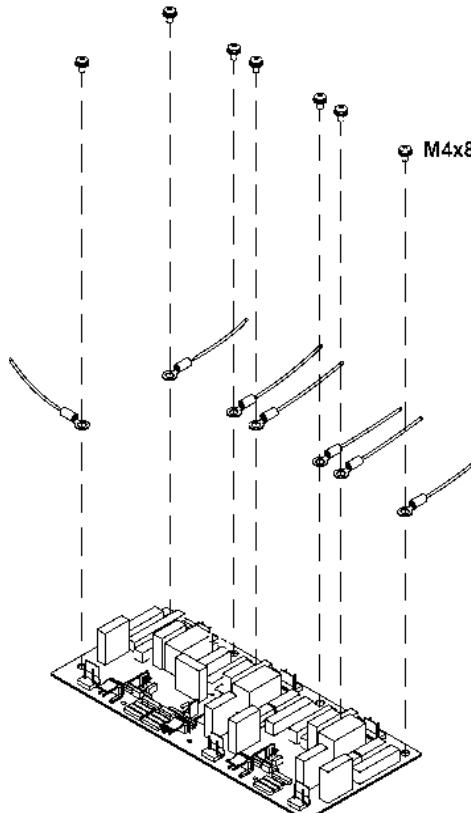


Figure 4.8(a). Disassembly of the Snubber, Trigger and Soft Charge protection

- 2) Disconnect all output wiring (figure 4.8(b)).

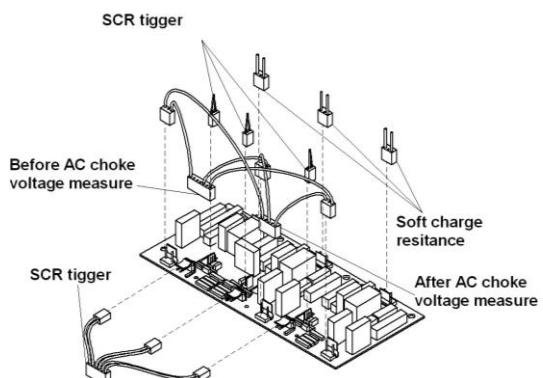


Figure 4.8.(b) Disassembly of the Snubber, Trigger and Soft Charge protection

- 3) Unscrew the 3 Phillips screws on **M3x8** DIN-7895H, which join the board and the hexagonal spacers **M3x10**, placed in the Bus(+).
- 4) Unscrew the 3 Phillips screw **M3x8** DIN-7895H, which join the board and the hexagonal spacers **M3x10**, placed in the Bus(+).
- 5) Remove the Board.

Assembly of the Snubber, Trigger and Soft Charge protection board

- 1) Avoid an excessive handling of the new board.
- 2) Place the Board in the position shown in the figure 4.8 (c)
- 3) Screw the 3 screw **M3x8** DIN-7895H, which join the board and the hexagonal spacers **M3x10**.
- 4) Screw the 3 Phillips screws **M3x8** DIN-7895H, which join this board and the hexagonal spacers **M3x15**.
- 5) Connect all input wiring (voltage measure cable before and after the AC Chokes) by screwing the Phillips screw **M4x8** DIN-7895H, which joins the wire terminals and the board (figure 4.8(a)).
- 6) Connect all output wiring (figure 4.8(b))

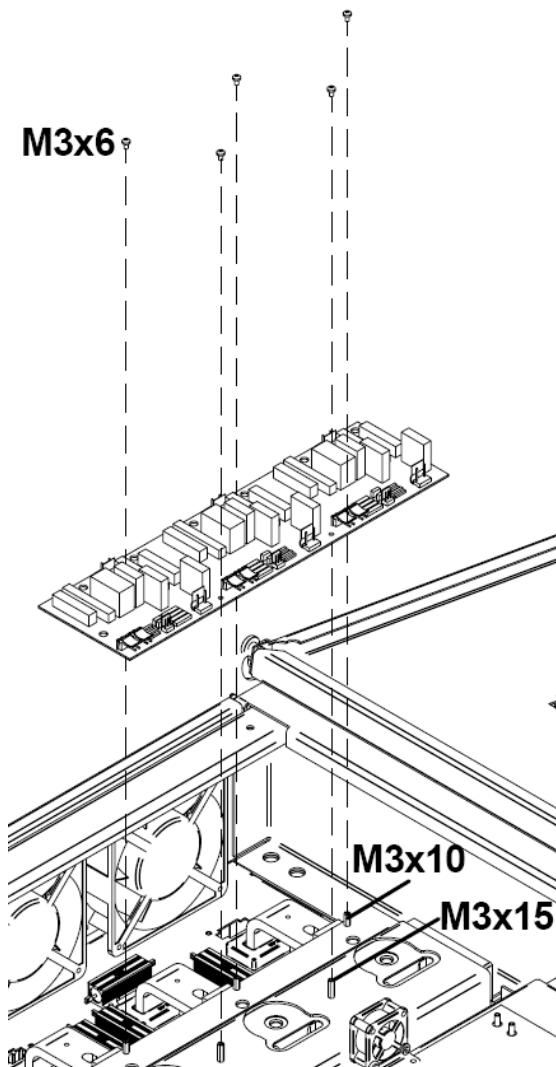


Figure 4.8. (c) Disassembly of the Snubber, Trigger and Soft Charge protection

7.6.7 FANS POWER SUPPLY.

Disassembly of the fans power supply

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 4.10 while reading these instructions:

- 1) Disconnect the 2 fans power wires, and the power wire of the fan power supply.
- 2) Unscrew the 3 Phillips screws **M3x6 DIN-7895H**, which join the fans power supply and the fan tray.
- 3) Remove the fan power supply.

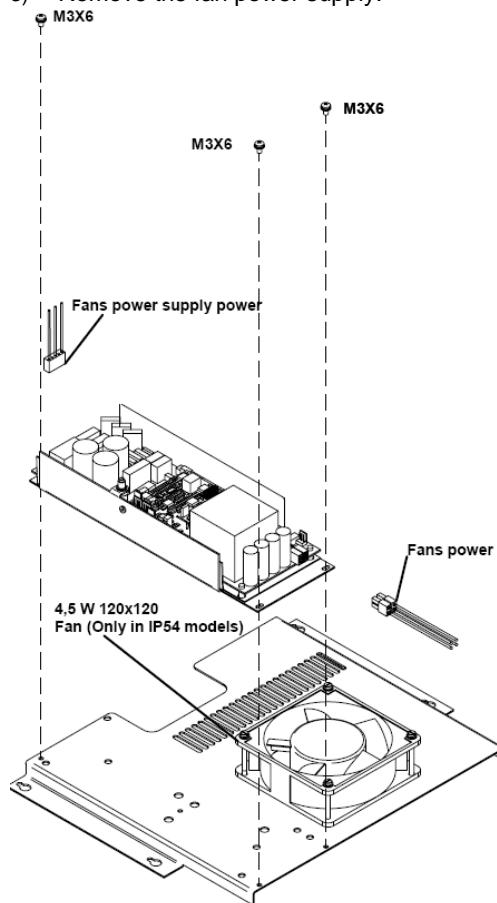


Figure 4.10. Disassembly of the fans power supply.

Assembly of the fans power supply.

Continue to observe static safe work procedures.

- 1) Place the new fans power supply in the fan tray.
- 2) Screw the 3 Phillips screws **M3x6 DIN-7895H**, which join the fans power supply and the fan tray.
- 3) Connect the 2 fans power wires and the power wire.

7.6.8 OUTPUT CHOKES.

Disassembly of the output choke

Follow figure 3.10 while reading these instructions:

- 1) Remove the fan tray by screwing the 4 Phillips screws **M4x8 DIN-7895H**, which join this tray and the chassis sides. In IP54 models, before disassembling the fan tray, the fan power wire must have been disconnected (IP00 and IP20 models have not any fan in this tray).
- 2) Unscrew the 2 hexagonal screws **M8x25 DIN-933**, which join the output choke and DCCT bar and output bar.
- 3) Remove the output choke

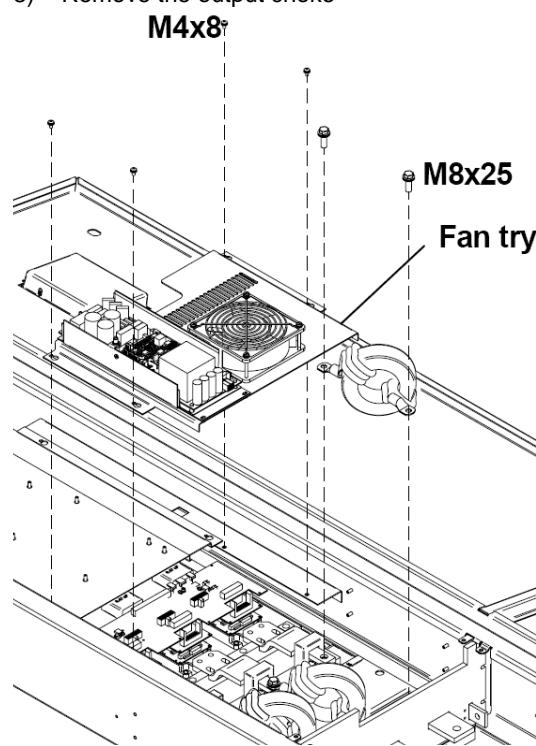


Figure 4.11. Disassembly of the output choke

Assembly of the output choke

- 1) Insert the output choke as it is shown in figure 4.11.
- 2) Connect the terminals of the output choke wire to the DCCT bar and output bar by screwing the 2 hexagonal screws **M8x25 DIN 933**.
- 3) Insert the fan tray by screwing the 4 Phillips screws **M4x8 DIN-7895H**, which join this tray and the chassis.

7.6.9 DCCT

Disassembly of the DCCT

Before proceeding, the output choke must have been disassembled (section 7.6.8).

Follow figure 4.12 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M4x12 DIN-7895H**, which join the DCCT and the DCCT bakelite.
- 2) Disconnect the current measure cable.
- 3) Disassemble the DCCT.

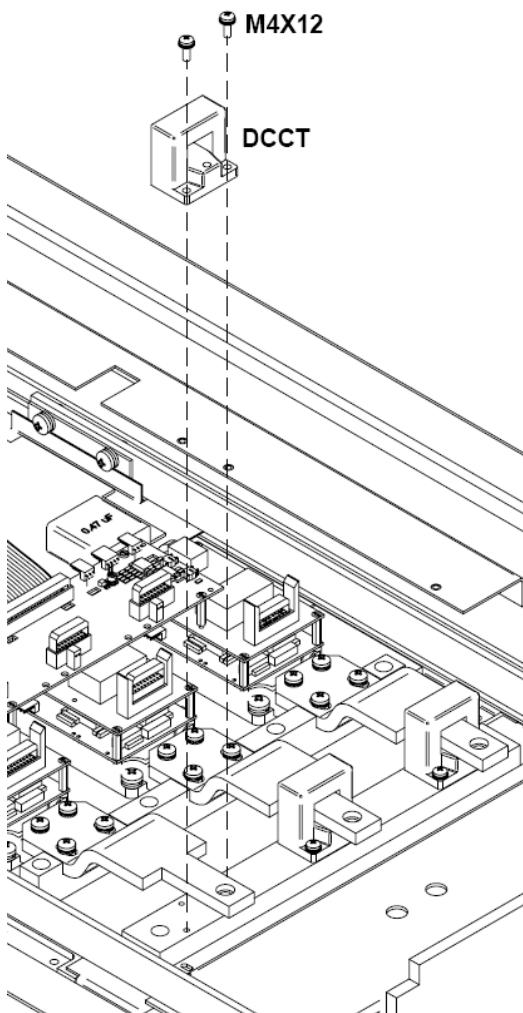


Figure 4.12. Disassembly of the DCCT

Assembly of the DCCT

- 1) Insert the new DCCT in the DCCT bakelite.
- 2) Join the DCCT and the DCCT bakelite by screwing the 2 Phillips screws **M4x12 DIN-7895H**.
- 3) Connect the current measure cable.

7.6.10 CHASSIS SIDES

Disassembly of the chassis sides

Before proceeding, covers (section 7.6.1), the electric tray (section 7.6.12), the fan tray (section 7.6.8), the output bakelite (section 7.6.12) and the upper and lower covers (section 7.6.2) must have been disassembled.

Follow figure 4.13 while reading these instructions:

- 1) Disassemble the chassis reinforcements.
- 2) Unscrew the 4 hexagonal screws **M8x18 DIN-933**, which join the sides to the chassis.
- 3) Remove the sides.

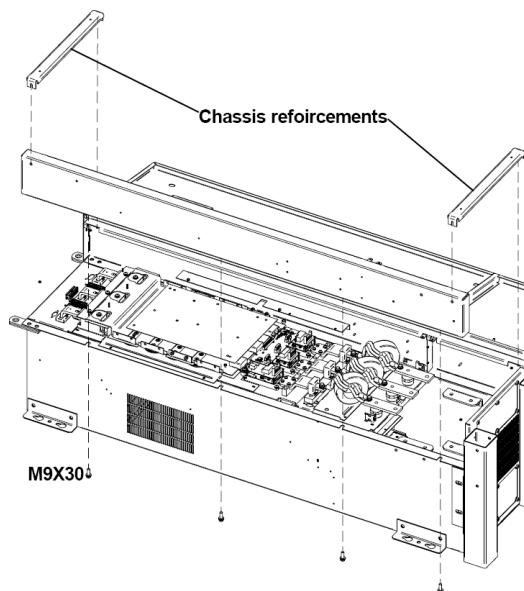


Figure 4.13. Disassembly of the chassis sides

Assembly of the chassis sides

- 1) Join the sides and the chassis by screwing the 7 hexagonal screws **M8x18 DIN-933**.
- 2) Join the chassis reinforcements.

7.6.11 OUTPUT BAKELITE.

Disassembly of the output bakelite

Before proceeding, the covers (see section 7.6.1) and the *electric tray* (see section 7.6.12) must have been disassembled.

Follow figure 4.14 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M6x20 DIN-7895H**, which join the Bus output terminals and the DC Bus.
- 2) Unscrew the 4 Phillips screws **M4x18 DIN-7895H**, which join the output bakelite and the chassis sides.
- 3) Remove the output bakelite.

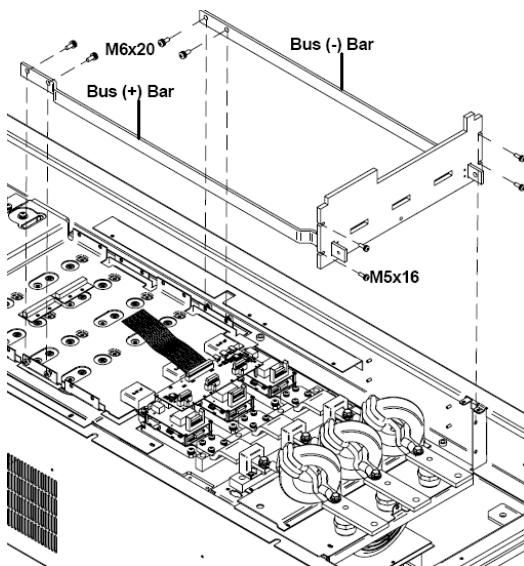


Figure 4.14. Disassembly of the output bakelite

Assembly of the output bakelite

- 1) Insert the output bakelite in the SD700 following figure 4.14.
- 2) Screw the 4 Phillips screws **M5x16 DIN-7895H**, which join the output bakelite and the chassis sides.
- 3) Screw the 2 Phillips screws **M6x20 DIN-7895H**, which join the Bus output terminals and the DC Bus

7.6.12 DC BUS

Disassembly of the DC Bus

Before proceeding, the Snubber, Trigger and Soft Charge board (see section 7.6.6) and the Bus output terminals (see section 7.6.11) must have been disassembled.

Follow figure 4.15 (a), 4.15 (b) and 4.15 (c) while reading these instructions:

- 1) Disassemble the electronic tray, where the Control and Power Board are inserted, by unscrewing the 4 Phillips screws **M4x8 DIN-7895H**, which join this tray and the chassis sides.
- 2) Disassemble the Snubbers capacitors by unscrewing the Phillips screws **M6x12 DIN-7895H**, which join the Snubbers capacitors and the DC Bus.
- 3) Remove the hexagonal spacers **M3x10** inserted in the DC Bus, which are inserted in the DC bus (+), where the Snubber, Trigger and Soft Charge Board leans.
- 4) Remove the hexagonal spacers **M3x15**, which are inserted in the DC bus (+), inserted in the DC Bus, where the front of the Snubber, Trigger and Soft Charge Board leans.
- 5) Disassemble one chassis side (see section 7.6.10).
- 6) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger
- 7) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the chassis
- 8) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger
- 9) Unscrew the 6 Phillips screws **M6x12 DIN-7895H**, which join the Bus(+) and the Bus(-) with the 3 SCRs.

Assembly of the DC Bus

- 1) Place the DC Bus on the chassis.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger.
- 3) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the chassis.

- 4) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join the DC Bus and the SCRs.
- 5) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger.
- 6) Insert the plastic hexagonal spacers **M3x10** on the DC Bus, where the back of the Snubber, Trigger and Soft Charge Board leans.
- 7) Insert the hexagonal spacers **M3x15** on the DC Bus, where the front of the Snubber, Trigger and Soft charge Board leans.
- 8) Place the Snubbers capacitors on the back of the DC Bus (see figure 4.15) by screwing the Phillips screws **M6x12 DIN-7895H**.
- 9) Insert the chassis side (see section 7.6.10).
- 10) Insert the electronic tray, where the Power and the Control Board are joined, by screwing the 4 Phillips screws **M4x8 DIN-7895H**.

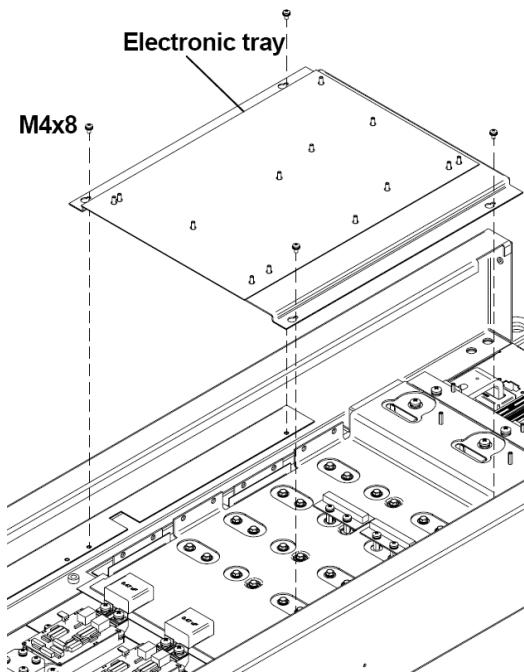


Figure 4.15. Disassembly of the DC Bus (a)

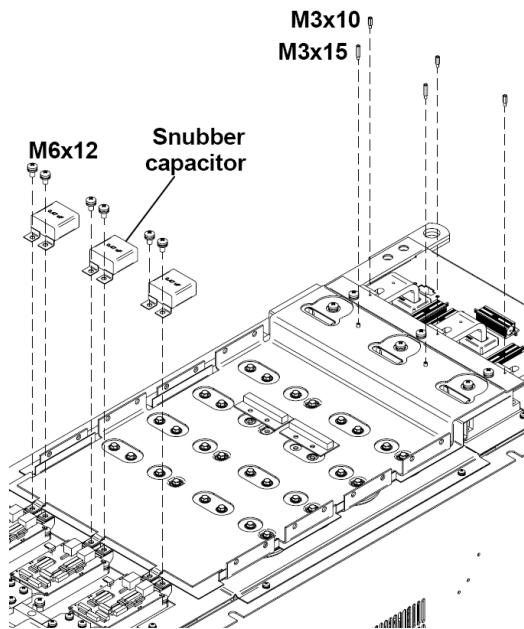


Figure 4.15. Disassembly of the DC Bus (b)

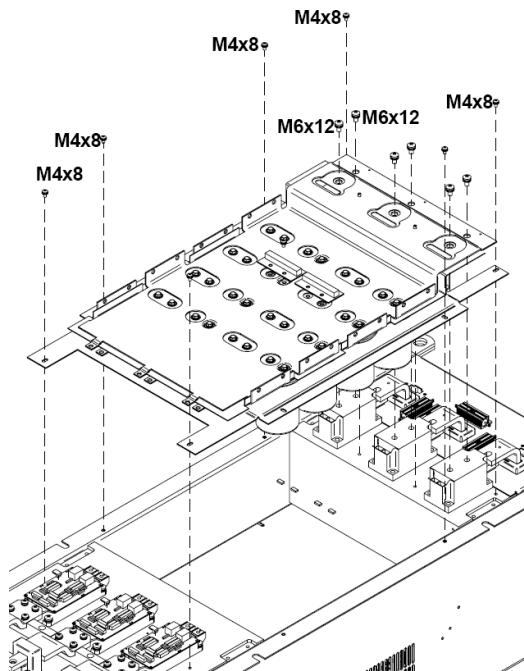


Figure 4.15. Disassembly of the DC Bus (c)

7.6.13 BUS CAPACITORS

Disassembly of the Bus capacitors

Before proceeding, the DC Bus must have been disassembled (*section 7.6.12*).

Follow *figure 3.16* while reading these instructions:

- 1) Unscrew the specials hexagonal screws **M5x20**, which join the capacitor and the Bus(+)
- 2) Remove the Bus(+)
- 3) Remove the Bus(+) and Bus(-) insulator.
- 4) Unscrew the special hexagonal screws **M5x20** which join with capacitor to the Bus (-).
- 5) Remove the Bus (-).
- 6) Remove the Bus(-) and the middle Bus insulator.
- 7) Unscrew the special hexagonal screws **M5x20**, which join the middle Bus and the capacitors.
- 8) Remove the middle Bus.
- 9) Take out the capacitors of their rings.

Assembly of the Bus capacitors

- 1) Place the new capacitors on their rings .
- 2) Insert the middle Bus (*figure 3.16*).
- 3) Screw the special hexagonal screws **M5x20**.
- 4) Insert the Bus(-) and middle Bus insulator.
- 5) Insert the Bus (-) (*figure 3.16*).
- 6) Screw the special hexagonal screws **M5x20**, which join the Bus (-) and the capacitors.
- 7) Place the Bus (+) and the Bus (-) insulator.
- 8) Insert the Bus (+) (*figure 3.16*).
- 9) Screw the special hexagonal screws **M5x20**, which join the Bus (+) and the capacitors.

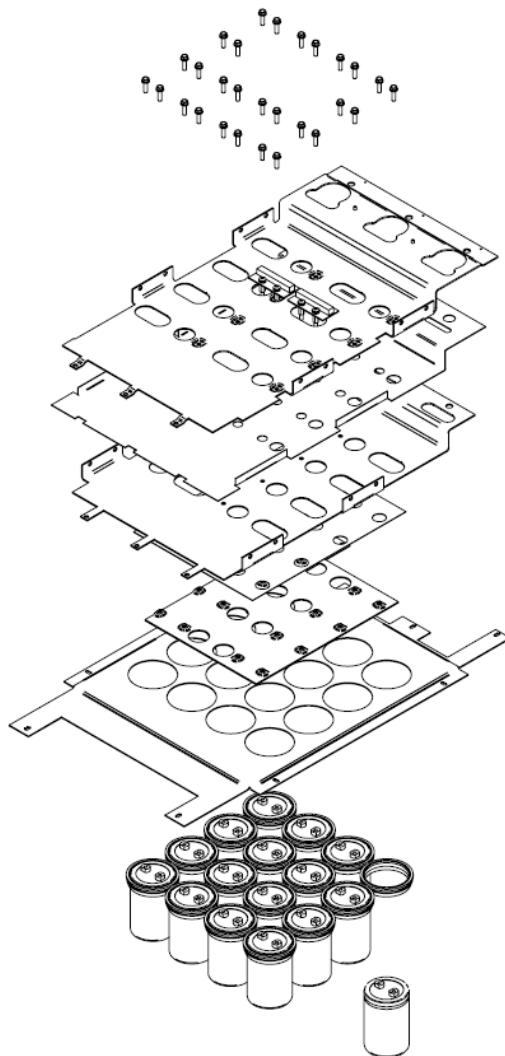


Figure 4.15. Disassembly of the Bus capacitors.

7.6.14 IGBTs CONNECTOR BOARD

Disassembly of the IGBTs connector board.

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 4.16* while reading these instructions:

- 1) Disconnect the IGBT trigger cable, which connects this board to the Power board.
- 2) Disconnect the 3 NTC wires, which connect this board to the upper Gate Drive.
- 3) Unscrew the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 4) Unscrew the 2 slotted cheese head screws **M3x30** DIN-84, which join this Board and the Upper Gate Drives.
- 5) Remove the IGBTs connector board. The plastic hexagonal spacers and the Nylon cases are not fixed anywhere, They are simply holding this board, so that take care not to lose them when the board is disassembled

Assembly of the IGBTs connector board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the new board on the plastic hexagonal spacers **M3x18** and Nylon cases.
- 3) Screw the 2 slotted cheese head screws **M3x30** DIN-84, which go through the Nylon cases and are joined to the hexagonal spacers **M3x18**, located under the Upper Gate Drive.
- 4) Screw the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 5) Connect the IGBT trigger cable.
- 6) Connect the NTC cables.

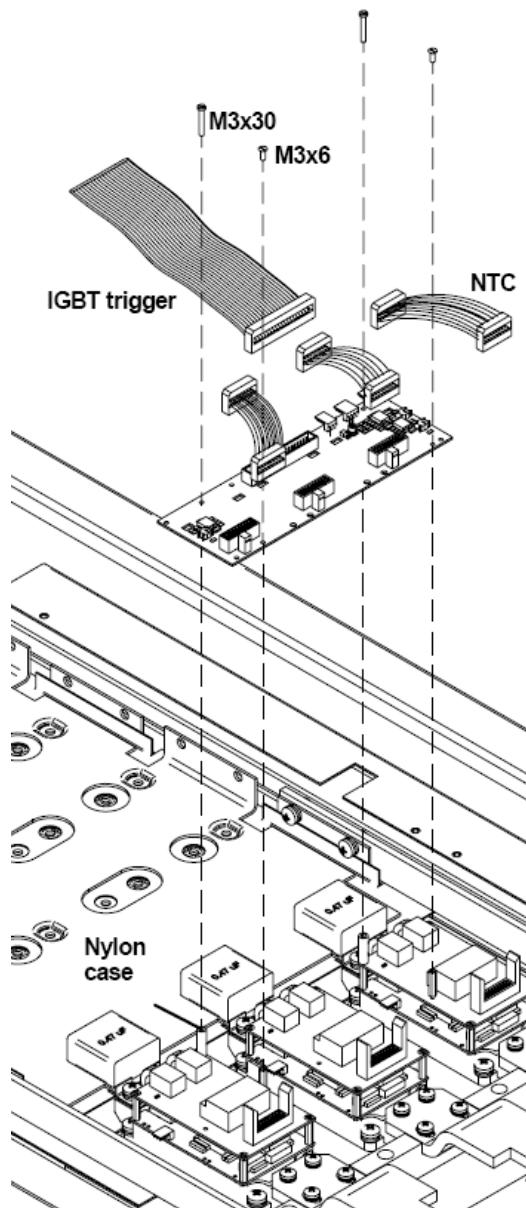


Figure 4.16. Disassembly of the IGBT Connector Board

7.6.15 UPPER GATE DRIVE

Assembly of the Upper Gate Drive

Before proceeding, the IGBTs connector board must have been removed removed. (section 7.6.14).

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 4.17* while reading these instructions:

- 1) Disconnect the phone cables, which connect this board to the lower Gate Drive.
- 2) Unscrew the Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 3) Remove the Upper Gate Drive.

Assembly of the Upper Gate Drive

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board
- 2) Place the next board on the hexagonal spacers **M3x18**. (*figure 4.17*).
- 3) Screw the 3 Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 4) Connect the phone cables.

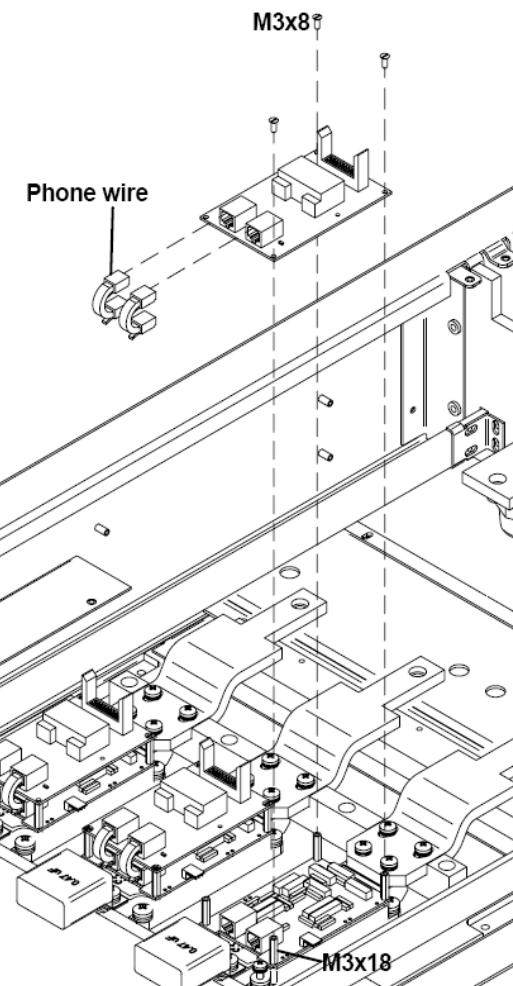


Figure 4.17. Assembly of the Upper Gate Drive

7.6.16. IGBT

Disassembly of the IGBT

Before proceeding, the Upper Gate Drive board must have been disassembled (section 7.6.15).

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 4.17 (a)* and *figure 4.17 (b)* while reading these instructions:

- 1) Unscrew the 4 hexagonal spacers **M3x18**, where the Upper Gate Drive is inserted.
- 2) Unscrew the 2 Phillips screws **M6x12 DIN-7895H**, which join the Snubber capacitors and the IGBTs.
- 3) Remove the DC Bus (section 7.6.12)
- 4) Remove the Snubber capacitors.
- 5) Unscrew the 3 Phillips screws **M6x20 DIN-7895H**, which join the IGBT and the bar where DCCTs are inserted.
- 6) Remove the bar, where the DCCTs are inserted.
- 7) Unscrew the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger
- 8) Remove the IGBT.

Assembly of the IGBT

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Remove the new IGBT of the static box.
- 3) Spread the thermal paste over the IGBT lower side .
- 4) Place the IGBT on the heat exchanger.
- 5) Screw the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 6) Put the DCCT Bar as it is shown in *figure 4.17*.
- 7) Insert the DC Bus (section 7.6.12).
- 8) Place the Snubber capacitor on the DC Bus.
- 9) Screw the 2 Phillips screws **M6x12 DIN-7895H**, which join the Snubber capacitors and the IGBTs.

- 10) Screw the 4 hexagonal spacers **M3x18**, where the Upper Gate Drive is inserted.

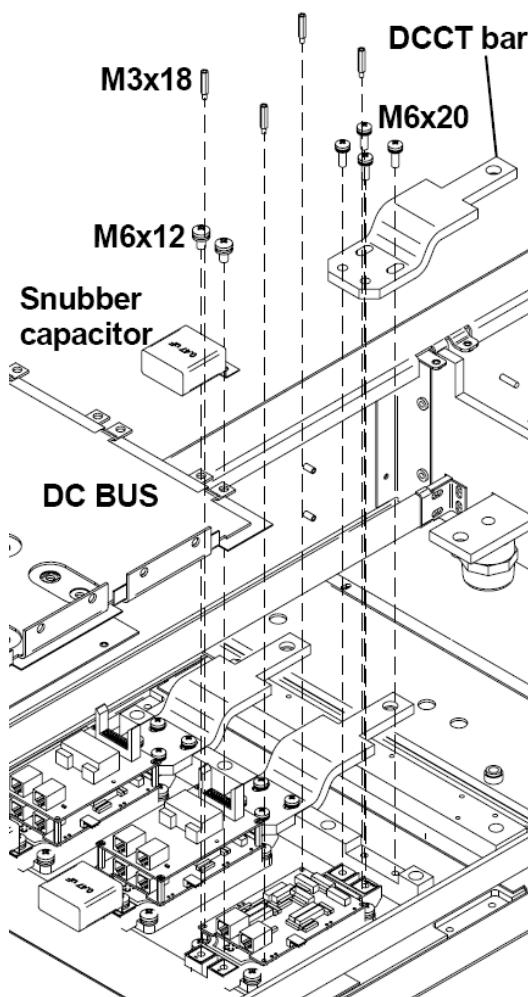


Figure 4.17. Assembly of the IGBT (a)

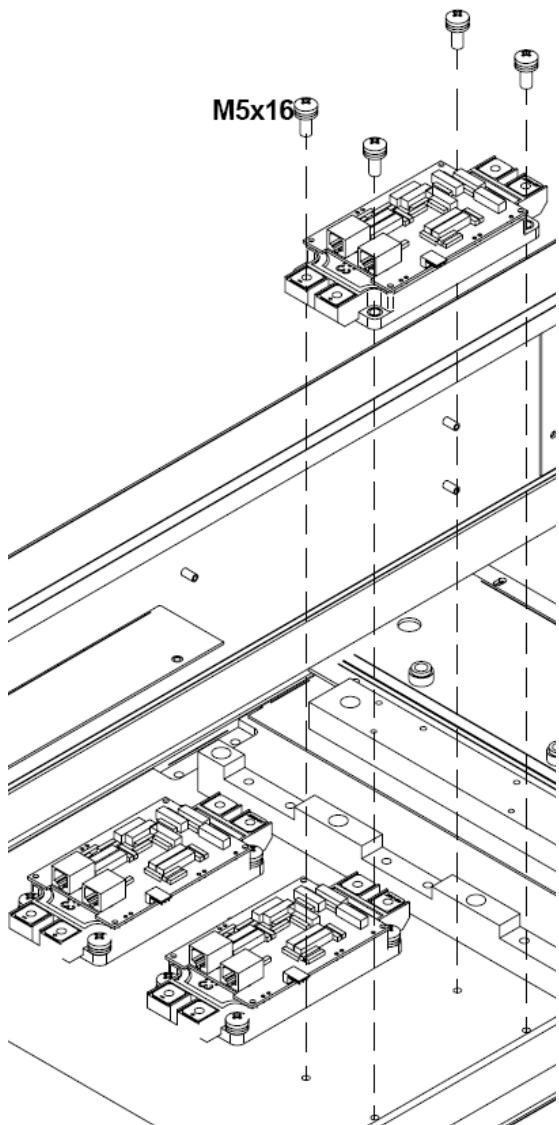


Figure 4.17. Assembly of the IGBT (b)

7.6.17. SOFT CHARGE AND QUICK-DISCHARGE RESISTORS.

Disassembly of the soft charge and quick-discharge

Before proceeding, the Upper cover (section 7.6.2), Snubber, Trigger and soft charge board (section 7.6.6), and the DC Bus (section 7.6.12) must have been disassembled.

Follow *figure 4.18 (a)* and *figure 4.18 (b)* while reading these instructions:

- 1) Unscrew the hexagonal screws **M8x25 DIN-933**, which join the bars and the SCRs.
- 2) Remove the voltage measure cable the after AC choke by unscrewing the Phillips screws **M4x8 DIN-7895H**, which join these wires and the bars.
- 3) Remove the bars.

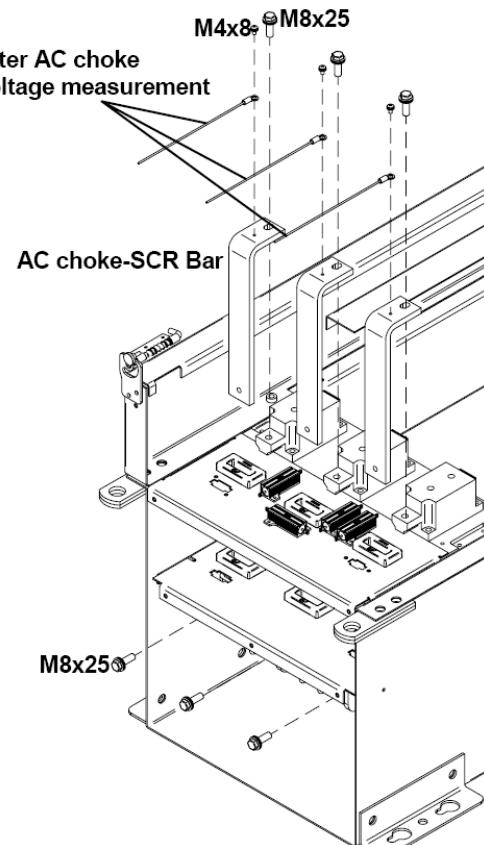


Figure 4.18. Disassembly of the Soft charge and quick-discharge resistors (a)

- 4) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the resistors support and the chassis.
- 5) Remove the resistors.

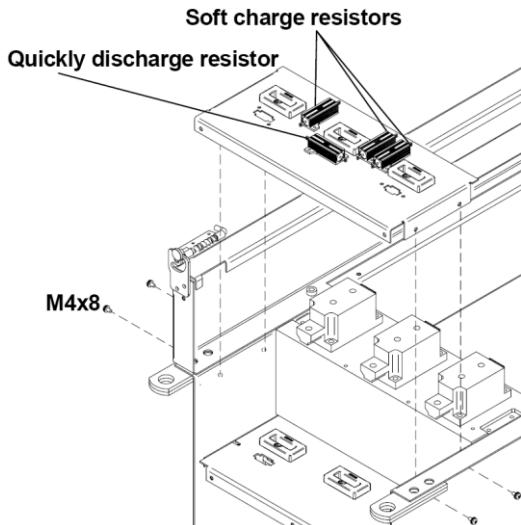


Figure 4.18. Assembly of the Soft charge and quick-discharge resistors (b)

Assembly of the Soft charge and quick-discharge resistors

- 1) Insert the resistors support on the chassis.
- 2) Screw the 4 Phillips screws **M4x8** DIN-7895H which join the resistors support with the chassis.
- 3) Insert the bars (figure 4.19)
- 4) Insert the voltage measure cable after the AC Choke by unscrewing the Phillips screws **M4x8** DIN-7895H, which join the wires and the bars.
- 5) Screw the hexagonal screws **M8x25** IN-933 895H, which join the bars and the AC Choke
- 6) Screw the hexagonal screws **M8x25** IN-933 895H , which join the bars and the SCRs.

7.6.18 SCRs

Disassembly of the SCRs

Before proceeding, the bars, which join the AC choke and the SCRs must have been disassembled (section 7.6.17).

Follow figure 4.19 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M5x20** DIN-7895H, which join the SCR and the heat exchanger.
- 2) Remove the SCR.

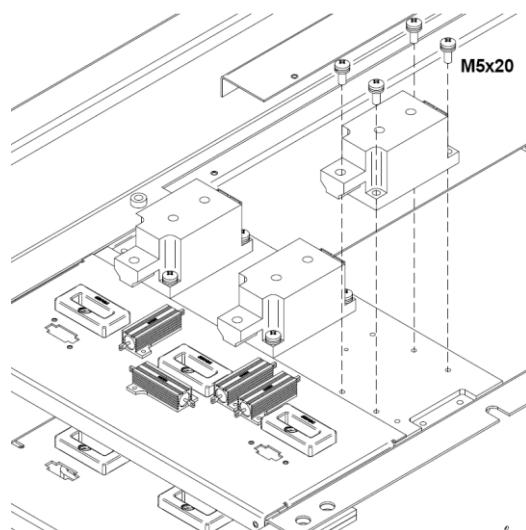


Figure 4.19. Disassembly of the SCR

Assembly of the SCRs

- 1) Spread the thermal paste on the back of new SCR.
- 2) Insert the SCR in the heat exchanger (see figure 4.19).
- 3) Screw the 2 Phillips screws **M5x20** DIN-7895H, which join the SCR and the heat exchanger.

7.6.19 POWER FANS.

Disassembly of the Fan support

Follow *figure 4.20 (a)* while reading these instructions

- 1) Unscrew the Phillips screw **M4x8 DIN-7895H** which joint the fan support and the fan box.
- 2) Unscrew the 2 Phillips screws **M4x8 DIN-7895H** which join the fan support and the output choke support.
- 3) Disconnect the fan power wire.
- 4) Remove the fan support.

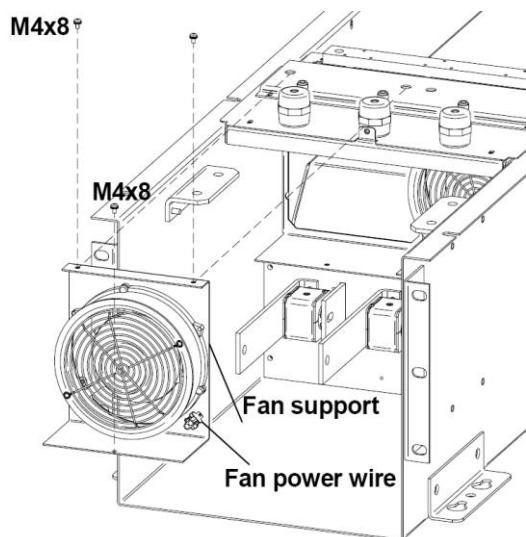


Figure 4.20. Disassembly of the fan support

Disassembly of the power fan support

24VDC, 2A, 48W, 172X172 FAN

Follow *figure 4.21(a)* while reading these instructions:

Unscrew the 2 slotted cheese head screws **M4x60 DIN-84**, which join the power fan and its support.

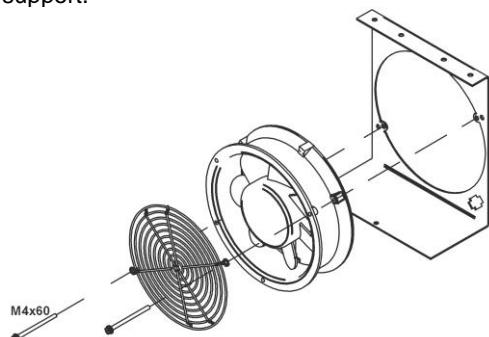


Figure 4.21 (a). Disassembly of the power fan

24VDC, 89W, 172X172 FAN

Follow *figure 4.21(b)* while reading these instructions:

Unscrew the 2 Phillips screws **M4x12 DIN-7895H**, which join the power fan and its support.

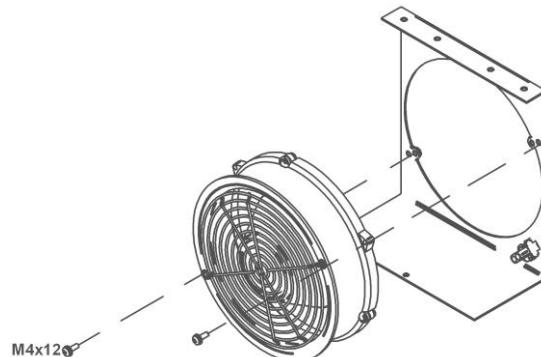


Figure 4.21 (b). Disassembly of the power fan

Assembly of the Fan support

- 1) Before inserting the fan support on the fan box, connect the fan power wire, and then insert the fan support in the fan box.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Screw the Phillips screw **M4x8 DIN-7895H**, which join the fan support and the fan box.

7.6.20 AC CHOKE.

Disassembly of the AC Choke

Before proceeding, the bars which join the AC choke and the SCRs (section 7.6.17), the AC choke-SCR bars (section 7.6.17) and the Upper cover (section 7.6.2) must have been disassembled.

Follow *figure 4.22* while reading these instructions:

- 1) Unscrew the 4 Phillips screws **M6x16 DIN-7895H**, which join the AC choke and the chassis.
- 2) Remove the AC choke out of the chassis and disconnect the 3 power wires by unscrewing the hexagonal screws **M8x25 DIN-961**, which join the power wires and the AC choke.
- 3) Remove the AC choke

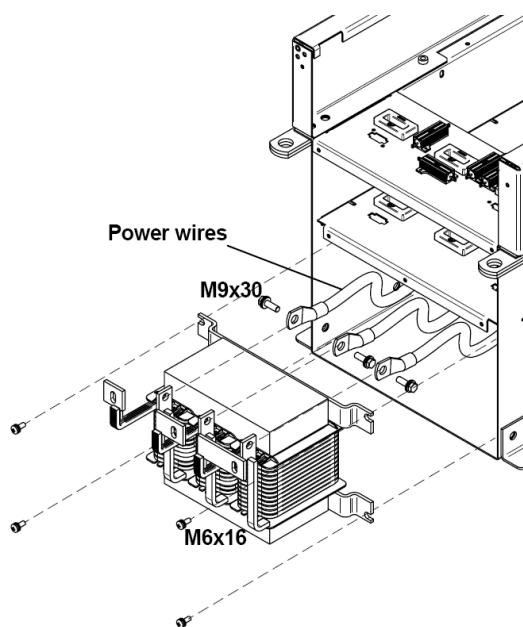


Figure 4.22. Disassembly of the AC choke

Assembly of the AC choke

- 1) Bring the AC choke near to the chassis and connect the power wires by screwing the hexagonal screws **M8x25 DIN-961**.
- 2) Insert the AC choke in the chassis and screw the 4 Phillips screws **M6x16 DIN-7895H**, which join the AC choke and the chassis.

7.7. SD700 FRAME 6.

7.7.1 ACCESS INSIDE.

Disassembly of the covers

Follow figure 5.1 y la figura 5.2 while reading these instructions:

- 1) Open the SDrive door.
- 2) Disconnect the Display from the Control Board.
- 3) Disconnect all control terminals (analogue inputs, digital inputs, PTC...).

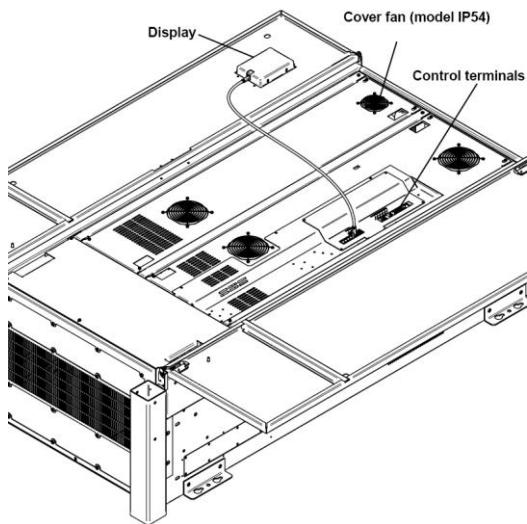


Figure 5.1 Disconnect the Display and the control terminals

- 4) Unscrew the 4 Phillips screws **M4x12** DIN-7895H, which join the cover and the chassis upper part.
- 5) Unscrew the 4 Phillips screws **M4x8** DIN-7895H, which join the cover and the lower part of the chassis.
- 6) In IP54 models, disconnect the fan power wires, which are in the covers before removing them.
- 7) Disassemble the covers.

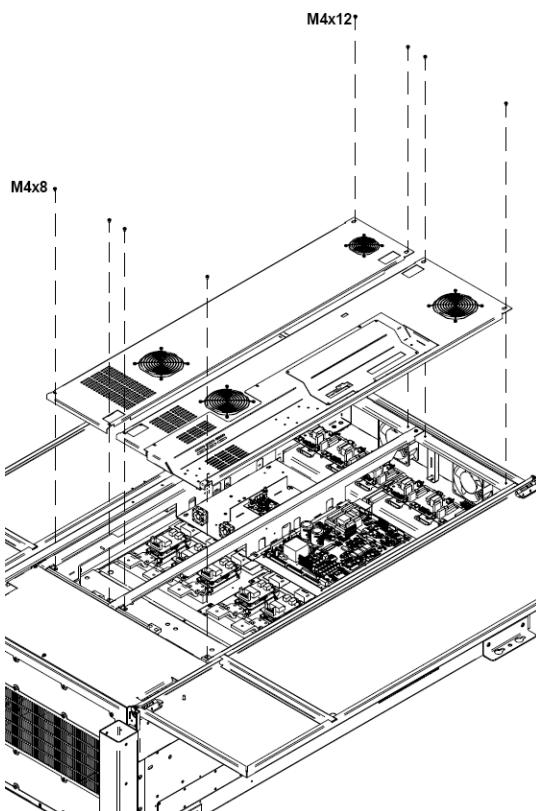


Figure 5.2 Disassembly of the covers

Assembly of the SD700 Covers

- 1) Place the covers on the chassis as it is shown in *figure 5.2*.
- 2) Screw the 4 Phillips screws **M4x12** DIN-7895H, which join the covers and the upper part of the chassis.
- 3) Screw the 4 Phillips screws **M4x8** DIN-7895H, which join the covers and the lower part of the chassis.
- 4) Connect the control terminals (analogue inputs, digital inputs, PTC...).
- 5) Connect the Display

Disassembly of the plastic protector

- 1) Unscrew the 5 Phillips **M4x8** DIN-7895-H, which join the plastic protector and the SDrive chassis .
- 2) Remove the plastic protector

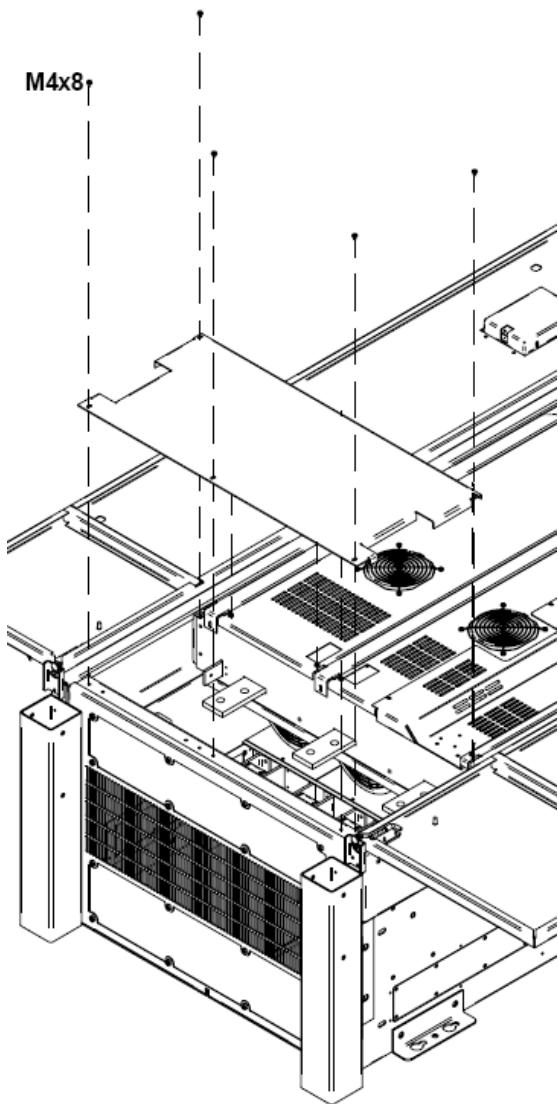


Figure 5.3 Disassembly of the plastic protector

Assembly of the plastic protector

- 1) Place the power terminals plastic protector on the SDrive chassis by screwing the 5 Phillips **M4x8** DIN-7895H.

7.7.2 UPPER COVER.

Disassembly of the upper cover

Follow *figure 4.4* while reading these instructions:

- 1) Unscrew the 9 Phillips **M4x8** DIN-7895H, which join the upper cover and the SD700 chassis.
- 2) In IP20 models, pull out the upper cover slowly in order to disconnect the fans supply wire.

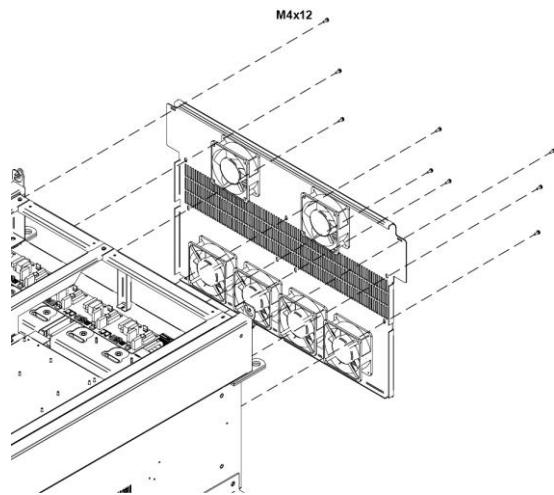


Figure 5.4 Disassembly of the upper cover

Assembly of the Upper cover

- 1) In IP20 models, connect the fans supply wire.
- 2) Join the Upper cover and the SD700 chassis by screwing the 9 Phillips screws **M4x8** DIN-7895H.

7.7.3 CONTROL BOARD

Disassembly of the Control Board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 4.4 while reading these instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control PCB and the plastic hexagonal spacers **M3x20**.
- 2) Disconnect the 40, 32 y 28 pin connectors which join the Control Board and the Power Board and then remove the Control Board
- 3) Put the Control Board in a static proof bag for safekeeping.

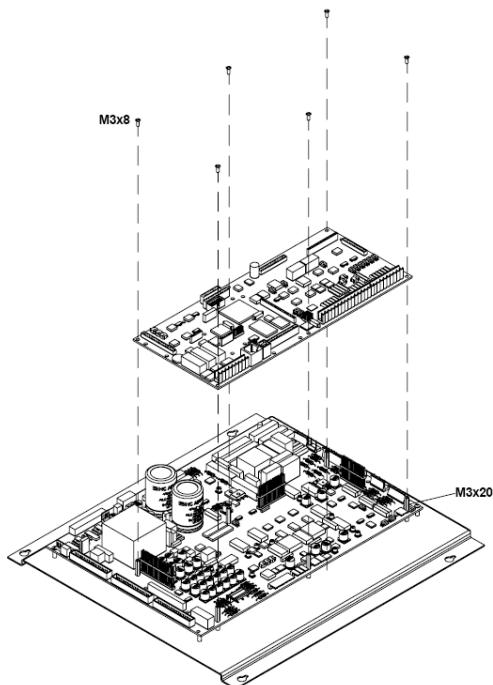


Figure 5.5 Disassembly of the Control Board

Assembly of the Control Board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new Control Board.
- 2) Place the new Control Board on the hexagonal spacers **M3x20**, fit the holes.
- 3) Push the 40, 32 y 28 pins connectors down. Do not apply force.
- 4) Screw the 6 plastic screws **M3x8** DIN-933 in the plastic hexagonal spacers **M3x20**.

7.7.4 POWER BOARD

Disassembly of the Power Board

Before proceeding, the Control Board must have been disassembled (section 7.7.5).

Follow figure 5.6 (a) and figure 5.6 (b) while reading these instructions:

- 1) Disconnect all the wires, which are connected to this Board.

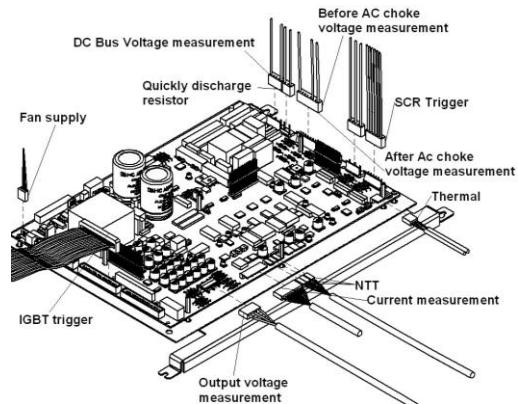


Figure 5.6 (a) Disconnection of the Power Board wires.

- 2) Remove the 6 plastic hexagonal spacers **M3x20** inserted in the Power Board.
- 3) Unscrew the 5 Phillips screws **M3x8** DIN-7895H.
- 4) Remove the Power Board.

Assembly of the Power Board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new Control Board.
- 2) Place the new board on the electric tray and fit the holes of the board in the electric tray bolts. (figure 5.6(a))
- 3) Screw the 5 Phillips screws **M3x8** DIN-7895H on the electric tray bolts.
- 4) Connect the Power Board wiring. (figure 5.6(a)).

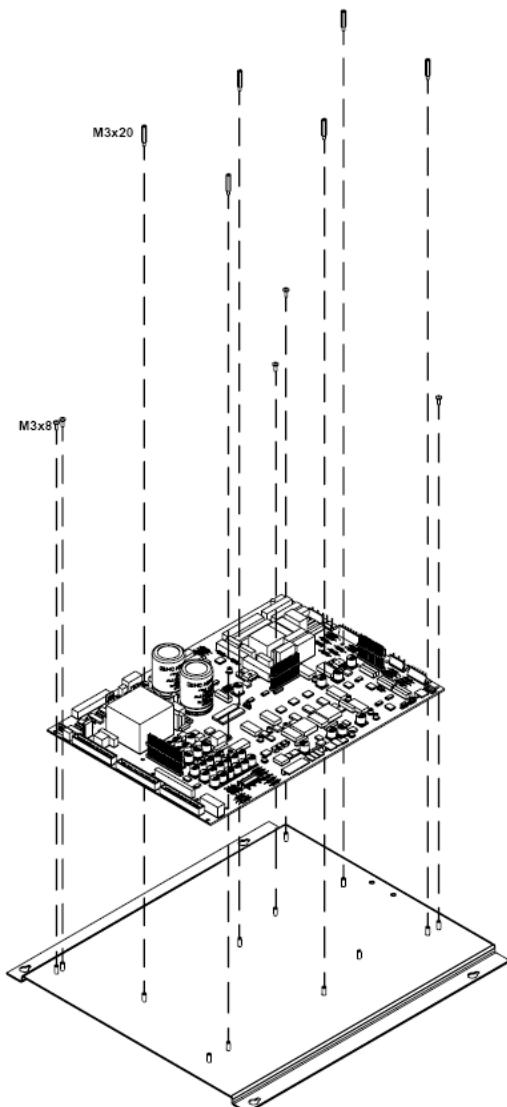


Figure 5.6 (b). Disassembly of the Power Board.

7.7.5 DRIVE SELECT AND IGBT SELECTION MODULE

Disassembly of the Drive Select

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 5.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

Disassembly of the IGBT selection module

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 5.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

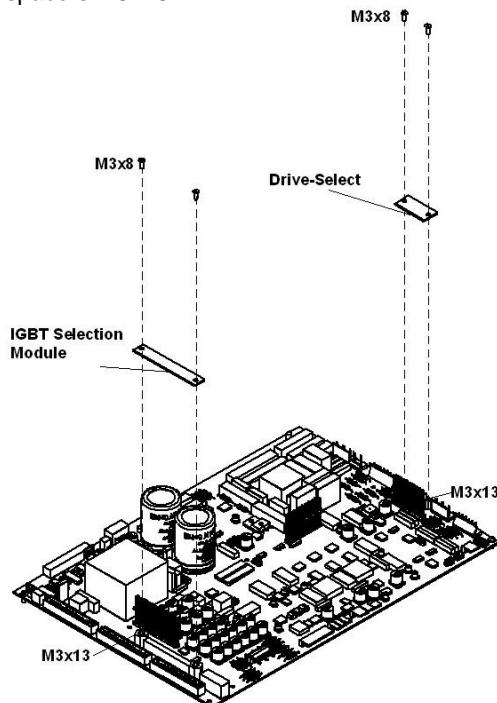


Figure 5.7. Disassembly of the Drive-select and the IGBT selection module

Assembly of the Drive Select

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

Assembly of the IGBT selection module

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

7.7.6 SNUBBER, TRIGGER AND SOFT CHARGE PROTECTION BOARD

Disassembly of the Snubber, trigger and soft charge protection board

The use of a static ground wrist strap and being earthed is highly required.

Follow figure 5.8 (a), figure 5.8 (b) and figure 5.8 (c) while reading these instructions:

- 1) Disconnect the voltage measure cable before and after the AC by unscrewing the Phillips screws **M4x8 DIN-7895H**, which join the wire terminals and the board (figure 5.8(a))
- 2) Disconnect all the output wiring (figure 5.8(b)).

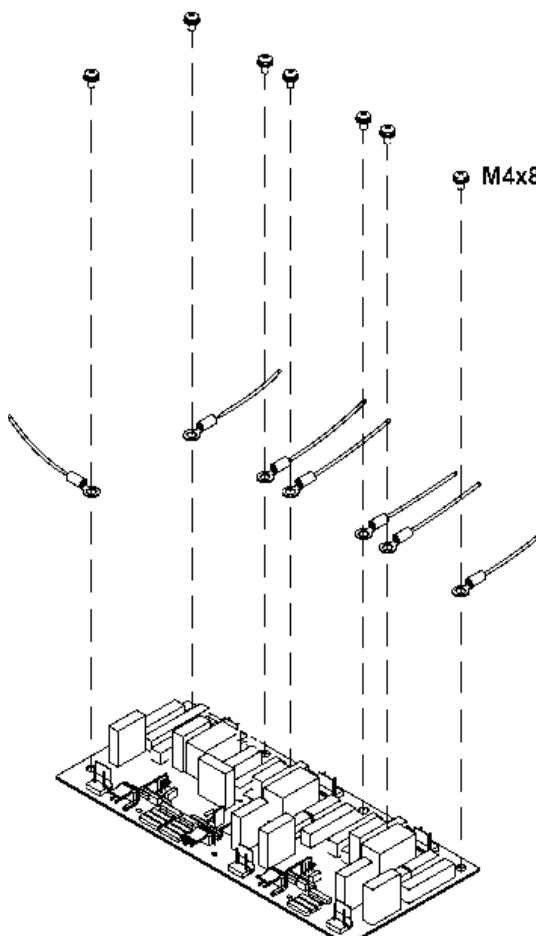


Figure 5.8.(a) Disassembly of the snubber, trigger and soft charge protection

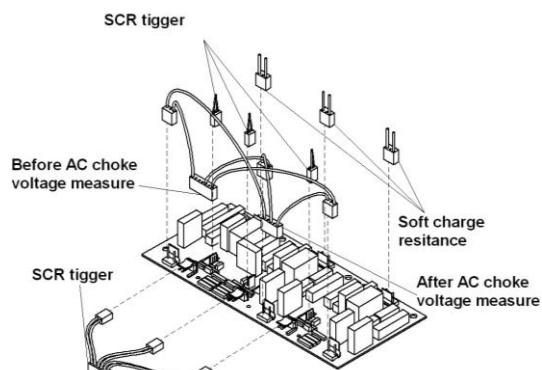


Figure 5.8. (b) Disassembly of the Snubber, Trigger and Soft charge protection

- 3) Unscrew the 3 Phillips screws on **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**, placed in the Bus(+).
- 4) Unscrew the 3 Phillips screw **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**, placed in the Bus(+).
- 5) Disassemble the Board.

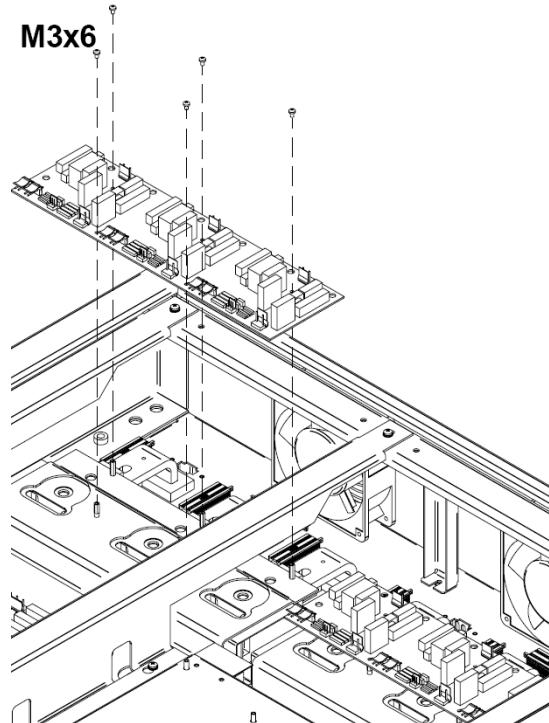


Figure 5.8. (c) Disassembly of the Snubber, Trigger and Soft Charge protection

Assembly of the Snubber, Trigger and Soft charge protection board

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the Board in the position as it is shown in *Figure 4.8 (c)*.
- 3) Screw the 3 screws **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**.
- 4) Screw the 3 Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x15**.
- 5) Connect all the input wiring (before and after the AC Choke voltage measure cable) by screwing the Phillips screw **M4x8 DIN-7895H**, which join the wire terminals and the board (*figure 5.8 (a)*)
- 6) Connect all the output wiring. (*figure 5.8 (b)*)

7.7.7 FANS POWER SUPPLY.

Assembly of the fans power supply

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 5.9 while reading these instructions:

- 1) Disconnect the 2 fans power wires, and the power wire of the fans power supply.
- 2) Unscrew the 3 Phillips screws **M3x6 DIN-7895H**, which join the fans power supply and the fan tray.
- 3) Disassemble the fan power supply.

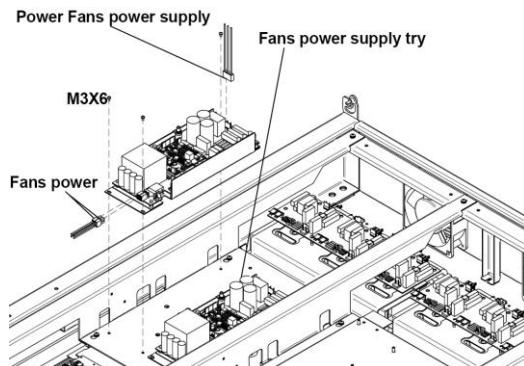


Figure 5.9. Disassembly of the fans supply power.

Assembly of the fans supply power

Continue to observe static safe work procedures.

- 1) Place the new fans supply power in the fan tray.
- 2) Screw the Phillips screws **M3x6 DIN-7895H**, which join the fans power supply and the fan tray.
- 3) Connect the 2 fans power wires and the fan power supply power wire.

7.7.8 OUTPUT CHOKES.

Disassembly of the output choke

Follow figure 5.10 while reading these instructions:

- 1) Unscrew the 2 hexagonal screws **M8x25** DIN-933, which join the output choke and the DCCT bar.
- 2) Disassemble the output choke

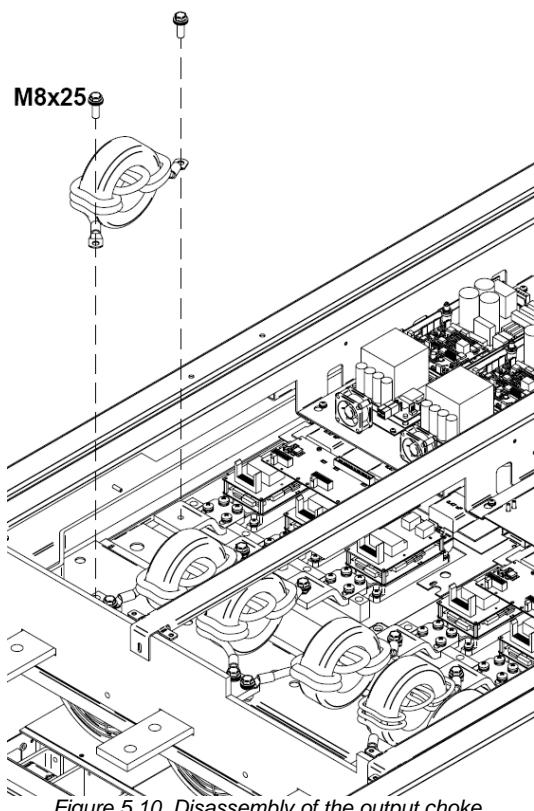


Figure 5.10. Disassembly of the output choke

Assembly of the output choke

- 1) Place the output choke as it is shown in figure 5.11.
- 2) Connect the terminals of the output choke wire to the DCCT bar by screwing the 2 hexagonal screws **M8x25** DIN 933.

7.7.9 DCCT

Disassembly of the DCCT

Before proceeding, the output choke must have been disassembled (section 7.7.8).

Follow figure 5.11 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M4x12** DIN-7895H, which join the DCCT and the DCCT support.
- 2) Disconnect the current measure cable.
- 3) Disassemble the DCCT

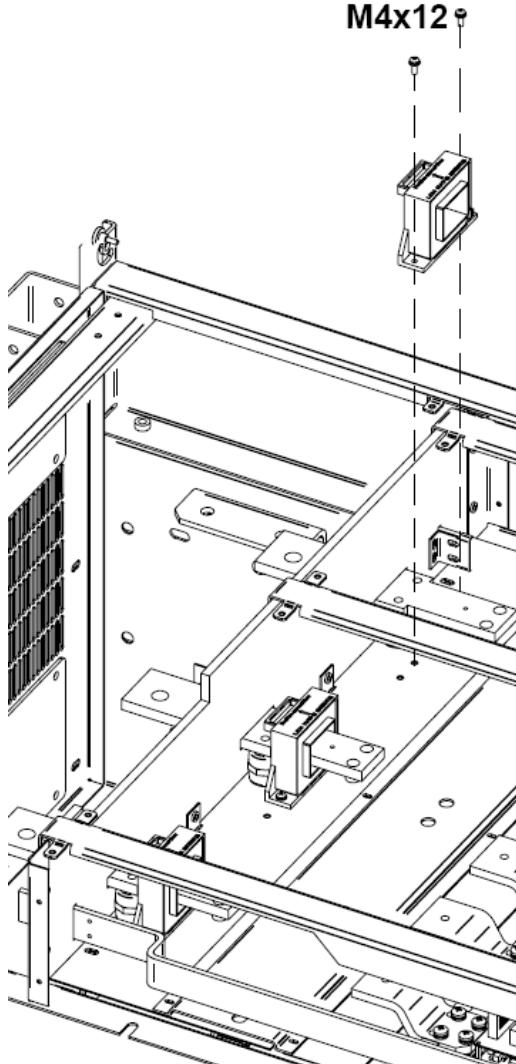


Figure 5.11. Disassembly of the DCCT

Assembly of the DCCT

- 1) Place the new DCCT in the place of the old one.
- 2) Join the DCCT and the DCCT support by screwing the 2 Phillips screws **M4x12** DIN-7895H.
- 3) Connect the current measure cable.

7.7.10 DC BUS

Disassembly of the DC Bus

Before proceeding, the Snubber, Trigger and Soft charge board must have been disassembled (section 7.7.6).

Follow *figure 5.12 (a)*, *figure 5.12 (b)*, *figure 5.12 (c)* and *figure 5.12 (d)* while reading these instructions:

- 1) Disassemble the electronic tray by unscrewing the 4 Phillips screws **M4x8 DIN-7895H**, which join this tray and the chassis sides.
- 2) Disassemble the snubbers capacitors by unscrewing the Phillips screws **M6x12 DIN-7895H** which join the snubbers capacitors and the DC Bus.
- 3) Disassemble the hexagonal spacers **M3x10**, which are inserted in the DC Bus, and where the back of the Snubber, Trigger and Soft charge Board leans.
- 4) Disassemble the hexagonal spacers **M3x15**, which are inserted in the DC Bus, and where the front of the Snubber, Trigger and soft charge Board leans.
- 5) Unscrew the 8 Phillips **M4x8 DIN-7895H** screws, which join the DC Bus and the Bridge bus.
- 6) Unscrew the 2 Phillips **M4x8 DIN-7895H** screws, which join the DC Bus and the Bus bar.
- 7) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the chassis
- 8) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger
- 9) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger
- 10) Unscrew the 6 Phillips screws **M6x12 DIN-7895H**, which join the Bus(+) and the Bus(-) with the 3 SCRs

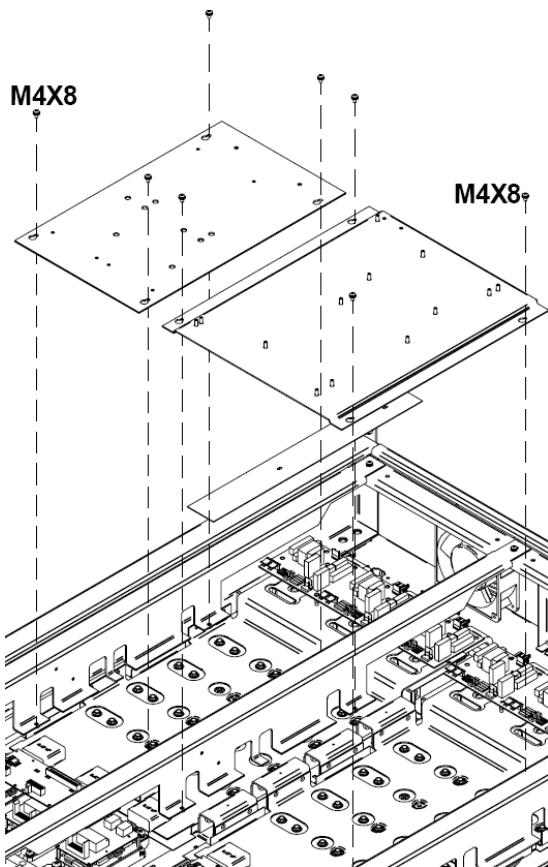


Figure 5.12 (a) Disassembly of the DC Bus.

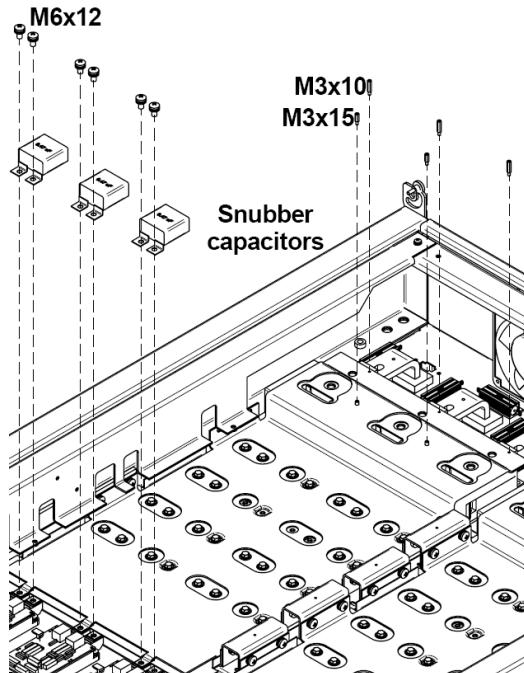


Figure 5.12. (b) Disassembly of the DC Bus

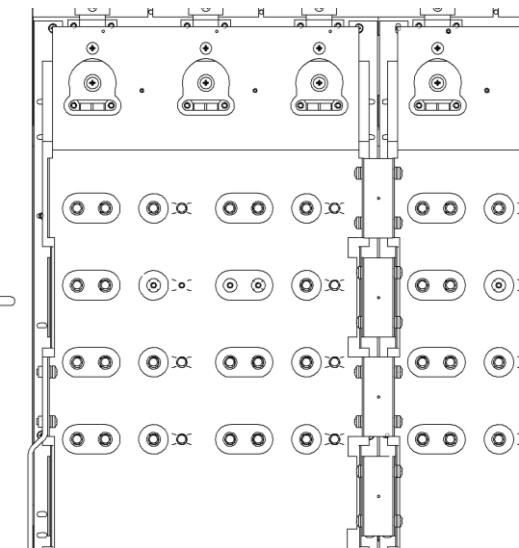


Figure 5.12. (c) Bus bridge.

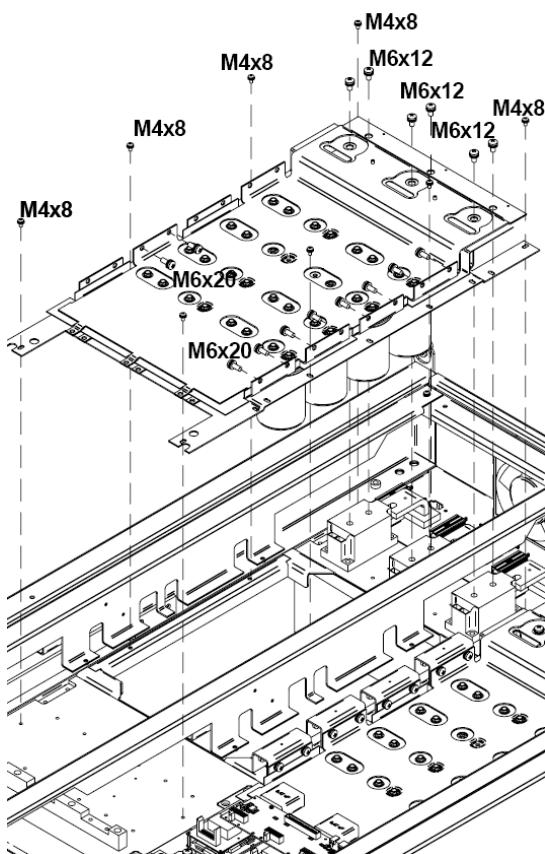


Figure 5.12. (d) Disassembly of the DC Bus

Assembly of DC Bus

- 1) Place the DC Bus on the chassis.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger.
- 3) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC BUS and the chassis.
- 4) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join DC Bus and the SCRs.
- 5) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join DC Bus and the SCRs.
- 6) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger.
- 7) Insert the plastic hexagonal spacers **M3x10** in the DC Bus, where the back of the Snubber, Trigger and Soft charge Board leans.
- 8) Insert the hexagonal spacers **M3x15** in the DC Bus, where the back of the Snubber, Trigger and Soft charge Board leans.
- 9) Place the Snubber capacitors on the back of the DC Bus (see figure 3.15) by screwing the Phillips screws **M6x12 DIN-7895H**.
- 10) Screw the 8 Phillips screws, which join the DC Bus and the Bus bridge.
- 11) Insert the electronic tray by screwing the 4 Phillips screws **M4x8 DIN-7895H**.

7.7.11 BUS CAPACITORS

Disassembly of the Bus capacitors

Before proceeding, the DC Bus must have been disassembled. (section 7.7.10).

Follow *figure 5.13* while reading these instructions:

- 1) Unscrew the specials hexagonal screws **M5x20**, which join the capacitor and the Bus(+).
- 2) Remove the Bus(+)
- 3) Remove the Bus(+) and Bus(-) insulator.
- 4) Unscrew the special hexagonal screws **M5x20**, which join the capacitor and the Bus(-).
- 5) Remove the Bus (-).
- 6) Remove the Bus(-) and the middle Bus insulator.
- 7) Unscrew the special hexagonal screws **M5x20**, which join the middle Bus and the capacitors.
- 8) Remove the middle Bus.
- 9) Take out the capacitors of their rings.

Assembly of the Bus capacitors

- 1) Place the new capacitors in their rings .
- 2) Insert the middle Bus (*figure 5.12*).
- 3) Screw the special hexagonal screws **M5x20**.
- 4) Insert the Bus(-) and the middle Bus insulator.
- 5) Insert the Bus (-) (*figure 5.12*).
- 6) Screw the special hexagonal screws **M5x20**, which join the Bus (-) and the capacitors.
- 7) Place the Bus (+) and the Bus (-) insulator.
- 8) Insert the Bus (+) (*figure 5.12*).
- 9) Screw the special hexagonal screws **M5x20**, which join the Bus (+) and the capacitors.

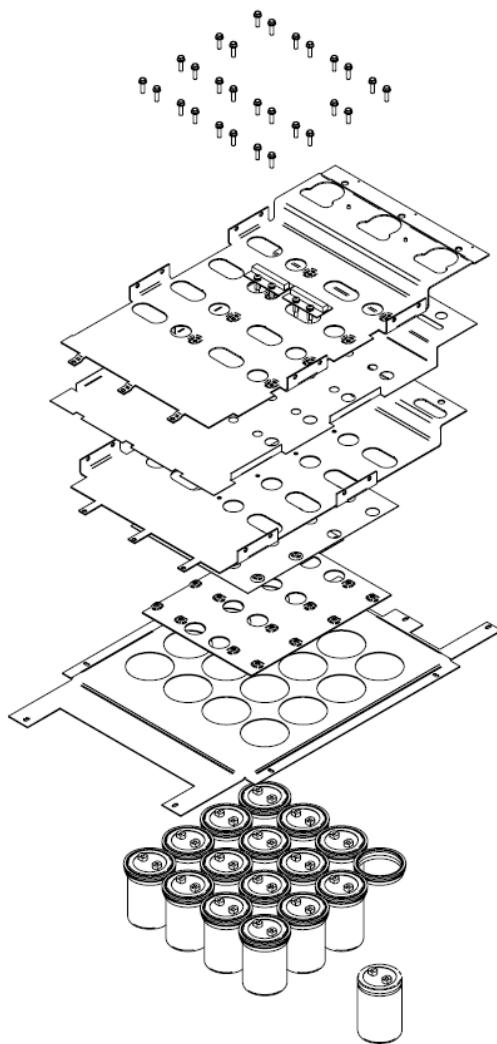


Figure 5.13. Disassembly of the Bus capacitors.

7.7.12 IGBTs CONNECTOR BOARD

Disassembly of the IGBTs connector board.

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 5.14* while reading these instructions:

Disconnect the IGBT trigger wire, which connects this board to the Power board

- 1) Disconnect the 3 NTC wires, which connect this board and the upper Gate Drive
- 2) Unscrew the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 3) Unscrew the 2 slotted cheese head screws **M3x30** DIN-84, which join this Board and the upper Gate Drives.
- 4) Remove the IGBTs connector board. The plastic hexagonal spacers and Nylon cases are not fixed anywhere, they are simply holding this board. Take care of not loosing them when the board is disassembled

Assembly of the IGBTs connector board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the new board on the plastic hexagonal spacers **M3x18** and the Nylon cases.
- 3) Screw the 2 slotted cheese head screws **M3x30** DIN-84, which are inserted into the Nylon cases and are joined to the hexagonal spacers **M3x18**, located under the upper Gate Drive.
- 4) Screw the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 5) Connect the IGBT trigger wire.
- 6) Connect the NTC wires.

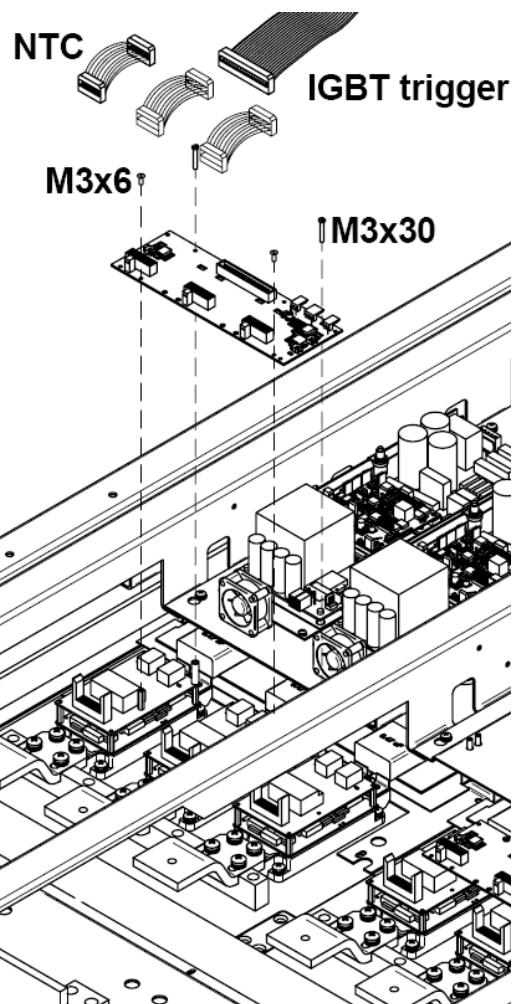


Figure 5.14. Disassembly of the IGBT Connector Board

7.7.13 UPPER GATE DRIVE

Disassembly of the Upper Gate Drive

Before proceeding, the IGBTs connector board must have been disassembled. (section 7.7.12).

Follow *figure 5.15* while reading these instructions:

- 1) Disconnect the phone wires, which connect this board and the lower Gate Drive.
- 2) Unscrew the Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 3) Disassemble the Upper Gate Drive.

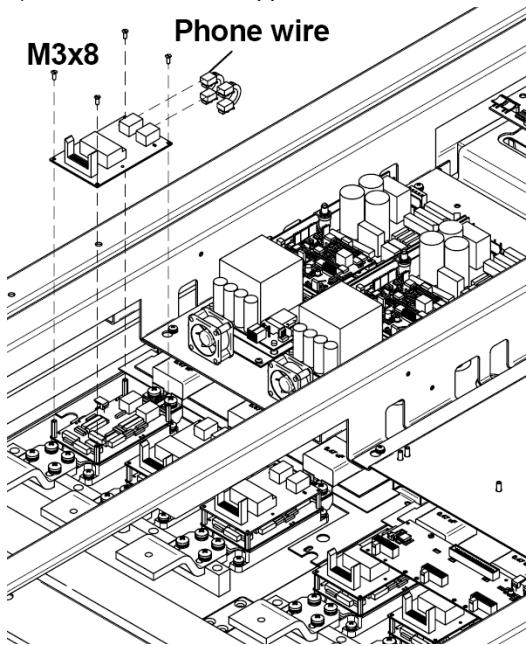


Figure 5.15. Disassembly of upper Gate Drive

Assembly of the Upper Gate Drive

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board .
- 2) Place the new board on the hexagonal spacers **M3x18**. (*figure 5.15*).
- 3) Screw the 3 Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 4) Connect the phone wires.

7.7.14. IGBT

Disassembly of the IGBT

Before proceeding, the upper Gate Drive board must have been disassembled. (section 7.7.14).

Follow *figure 5.16 (a)* and *figure 5.16 (b)* while reading these instructions :

- 1) Unscrew the 4 hexagonal spacers **M3x18**, where the Upper Gate Drive is inserted.
- 2) Unscrew the 2 Phillips screws **M6x12 DIN-7895H**, which join the Snubber capacitors and the IGBTs.
- 3) Remove the DC Bus (section 7.7.10).
- 4) Remove the Snubber capacitors.
- 5) Unscrew the 3 Phillips screws **M6x20 DIN-7895H**, which join the IGBT and the bar where DCCTs are screwed.
- 6) Disassemble the bar, where DCCTs are screwed.
- 7) Unscrew the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 8) Disassemble the IGBT.

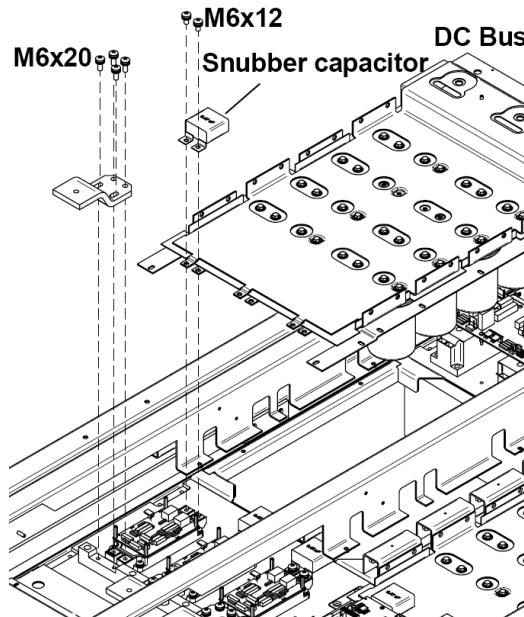


Figure 5.16. (a) Disassembly of the IGBT

Assembly of the IGBT

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.

- 2) Put the new IGBT of the static box.
- 3) Spread the thermal paste over the back of the IGBT.
- 4) Place the IGBT on the heat exchanger.
- 5) Screw the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 6) Place the DCCT Bar as it is shown in *figure 5.16*.
- 7) Insert the DC Bus (*section 7.7.10*).
- 8) Place the Snubber capacitor on the DC Bus.

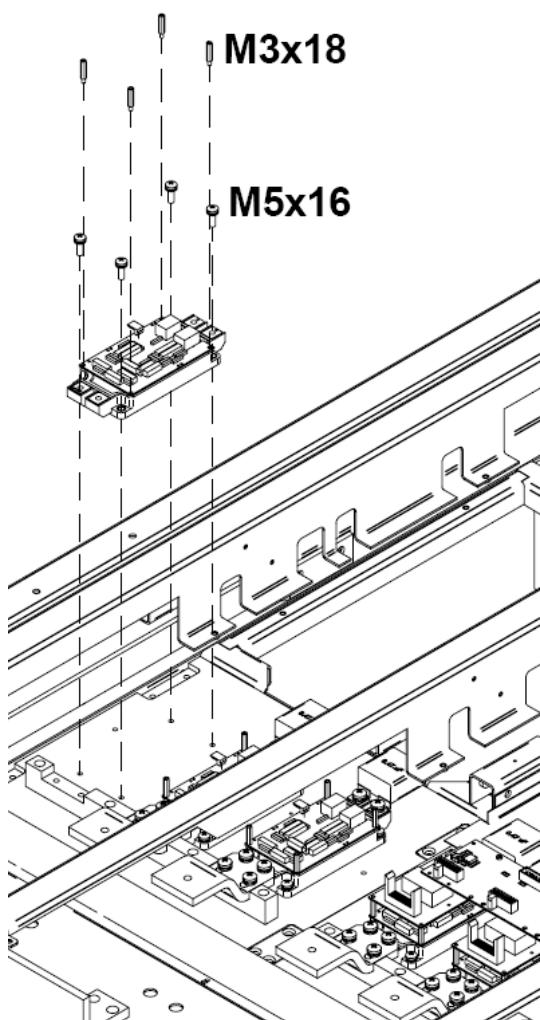


Figure 5.16. (b) Disassembly of the IGBT

7.7.15. SOFT CHARGE AND QUICK-DISCHARGE RESISTORS.

Soft charge and quick-discharge resistors

Before proceeding, the Upper cover (*section 7.7.2*), Snubber, Trigger and soft charge board (*section 7.7.6*), and the DC Bus (*section 7.7.10*) must have been disassembled.

Follow *figure 5.17 (a)* and *figure 5.17 (b)* while reading these instructions:

- 1) Unscrew the hexagonal screws **M8x25 DIN-933**, which join the bars and the SCRs.
- 2) Disassemble the measure voltage wire after the AC Choke by unscrewing the Phillips screws **M4x8 DIN-7895H**, which join these wires and the bars.
- 3) Remove the bars.

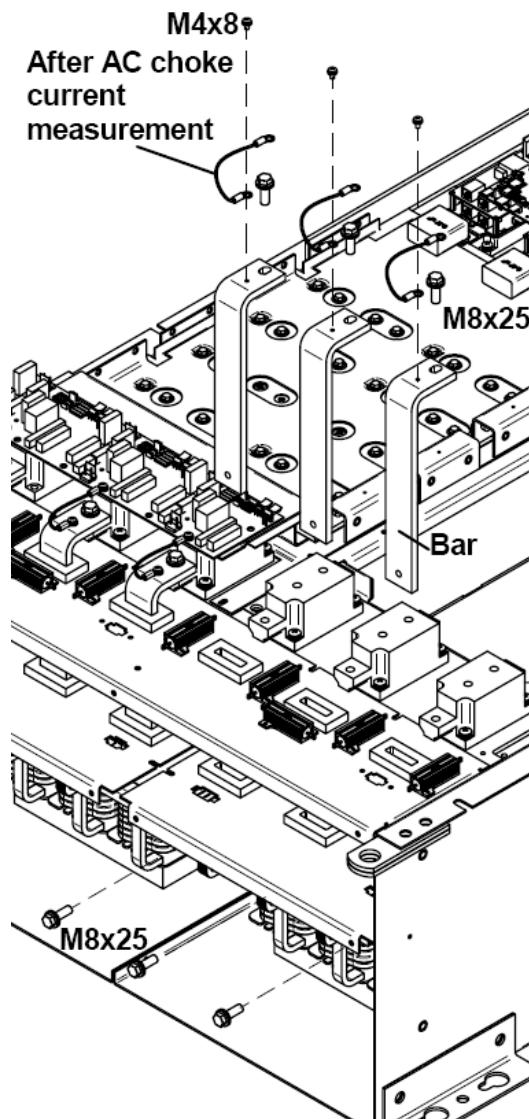


Figure 5.17(a) Disassembly of the Soft charge and quick-discharge resistors

- 4) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the support of the resistors and the chassis.
- 5) Remove the resistors.

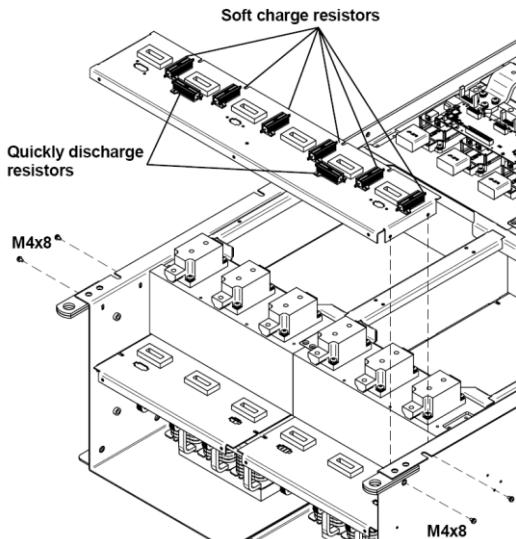


Figure 5.17(b). Disassembly of soft charge and quick-discharge resistors

Disassembly of the soft charge and quick-discharge resistors.

- 1) Insert the support of the resistors in the chassis.
- 2) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the support of the resistors and the chassis.
- 3) Insert the bars (figure 5.17(a))
- 4) Insert the voltage measure wire after the AC Choke by unscrewing the Phillips screws **M4x8 DIN-7895H**, which join the wires and the bars.
- 5) Screw the Phillips screws **M6x20 DIN-7895H**, which join the bars and the AC Choke.
- 7) Screw the Phillips screws **M6x16 DIN-7895H**, which join the bars and the SCRs.

7.7.16 SCRs

Removing the SCRs

Before proceeding, the bars which join the AC choke with SCRs must have been disassembled (section 7.7.15)

Follow *figure 5.18* while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M5x12 DIN-7895H** which join the SCR with the heat exchanger.
- 2) Disassemble the SCR.

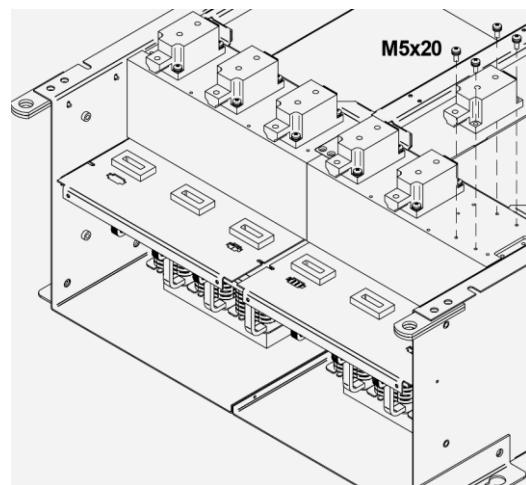


Figure 5.18. Disassembly of the SCR

Disassembly of the SCRs

- 1) Spread the thermal paste over the back of the new SCR.
- 2) Insert the SCR in the heat exchanger (*figure 5.18*)
- 3) Screw the 2 Phillips screws **M5x12 DIN-7895H**, which join the SCR and the heat exchanger.

7.7.17 POWER FAN

Disassembly of the Fan support

Follow *figure 5.19* while reading these instructions:

- 1) Unscrew the Phillips screw **M4x8 DIN-7895H**, which join the fan support and the fan box.
- 2) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Disconenct the fan power wire.
- 4) Disassemble the fan support.

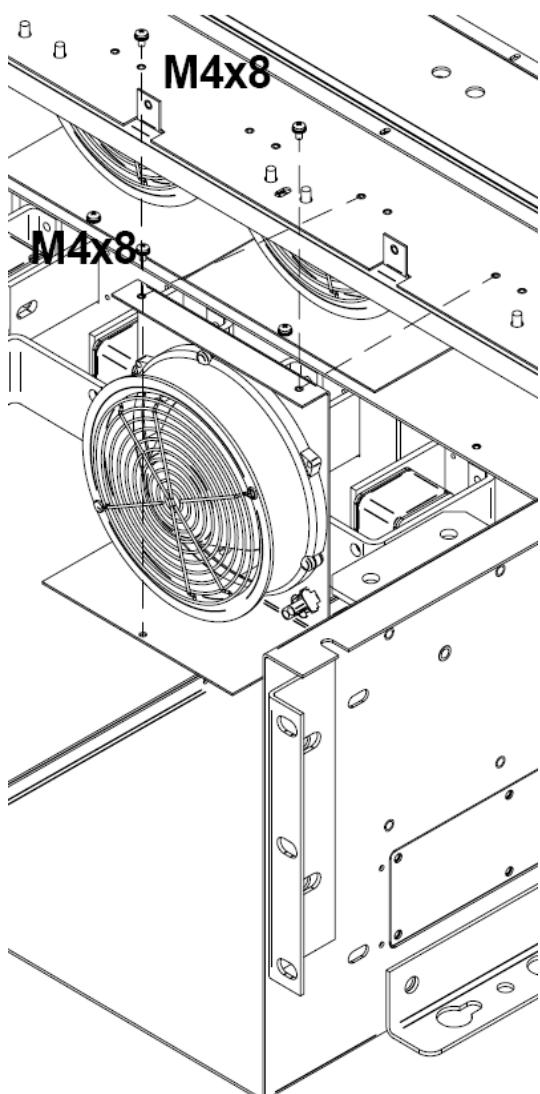


Figure 5.19. Disassembly of the power fan

24VDC, 2A, 48W, 172X172 FAN

Follow *figure 5.20(a)* while reading these instructions:

Unscrew the 2 slotted cheese head screws **M4x60 DIN-84**, which join the power fan and its support.

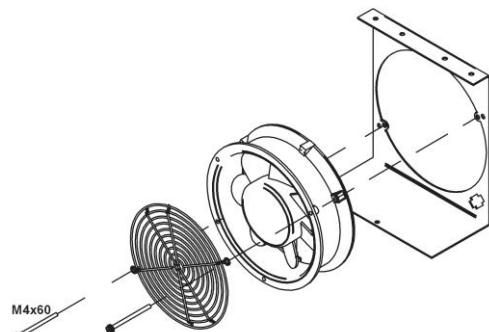


Figure 5.20 (a) . Disassembly of the fan support

24VDC, 89W, 172X172 FAN

Follow *figure 5.20(a)* while reading these instructions:

Unscrew the 2 Phillips screws **M4x12 DIN-7895H**, which join the power fan and its support.

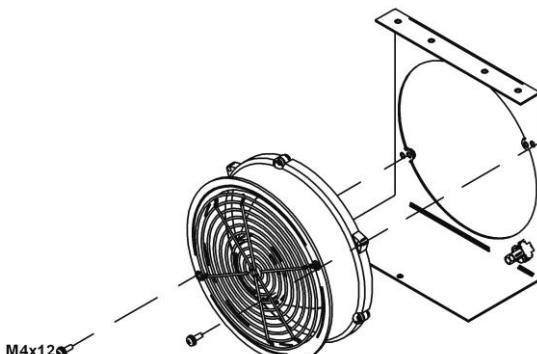


Figure 5.20 (b) . Disassembly of the fan support

Assembly of the Fan power support

- 1) Before inserting the fan support into the fan box, connect the fan power wire.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Screw the Phillips screw **M4x8 DIN-7895H**, which join the fan support and the fan box.

7.7.18 AC CHOKE.

Disassembly of the AC Choke

Before proceeding, the bars which join the AC choke and the SCRs (section 7.7.15) and upper cover (section 7.7.2) must have been disassembled

Follow *figure 5.22* while reading these instructions:

- 1) Unscrew the 4 Phillips screws **M6x16 DIN-7895H**, which join the AC choke and the chassis.
- 2) Disassemble the AC choke of the chassis, and disconnect the 3 power wires by unscrewing the hexagonal screws **M8x25 DIN-961**, which join the power wires and the AC choke.
- 3) Disassemble the AC choke.

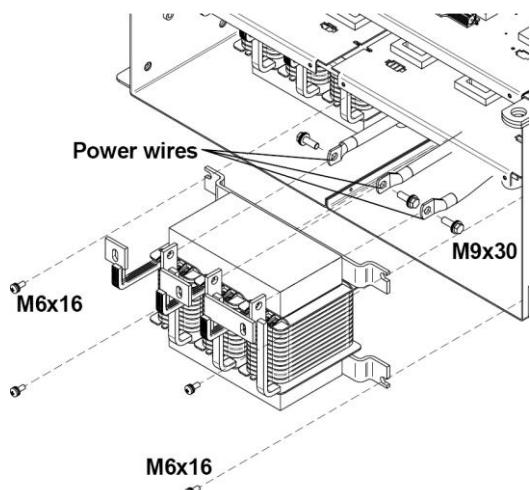


Figure 5.22. Disassembly of the AC choke

Assembly of the AC choke

- 1) Bring the AC choke near to the chassis and connect the power wires by screwing the hexagonal screws **M8x25 DIN-961**.
- 2) Insert the AC choke into the chassis and screw the 4 Phillips screws **M6x16 DIN-7895H**, which join the AC choke and the chassis.

7.8. SD700 FRAME 7.

7.8.1 ACCESS INSIDE.

Disassembly of the covers

Follow figure 6.1 and figure 6.2 while reading these instructions:

- 1) Open the SDrive door.
- 2) Disconnect the Display from the Control Board.
- 3) Disconnect all control terminals (analogue inputs, digital inputs, PTC...).

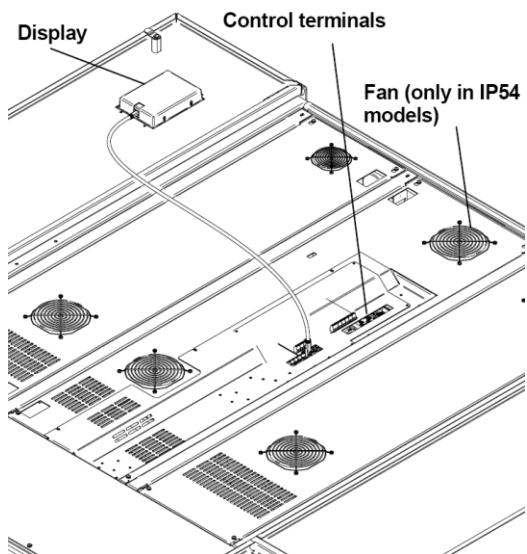


Figure 6.1 Disconnect the Display and the control terminals

- 4) Unscrew the 6 Phillips screws **M4x12** DIN-7895H, which join the cover and the upper part of the chassis.
- 5) Unscrew the 6 Phillips screws **M4x8** DIN-7895H, which join the cover and the lower part of the chassis.
- 6) In IP54 models, disconnect the fan power wires, which are placed in the covers before disassembling them.
- 7) Remove the covers.

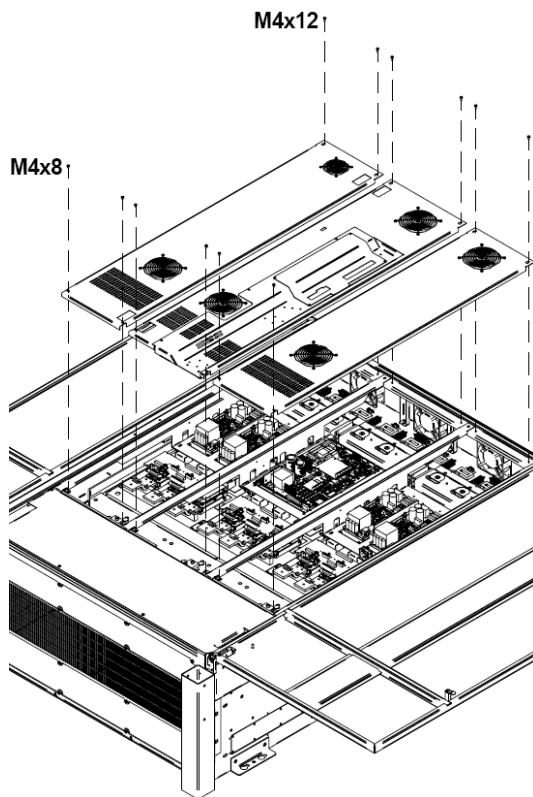


Figure 6.2 Disassembly of the covers

Assembly of the SD700 Covers

- 1) Place the covers on the chassis as it is shown in *figure 6.2*.
- 2) Screw the 6 Phillips screws **M4x12** DIN-7895H, which join the covers and the upper part of the chassis.
- 3) Screw the 6 Phillips screws **M4x8** DIN-7895H, which join the covers and the lower part of the chassis.
- 4) Connect the control terminals (analogue inputs, digital inputs, PTC...).
- 5) Connect the Display

Disassembly of the plastic protector

- 1) Unscrew the 6 Phillips **M4x8** DIN-7895-H, which join the plastic protector and the SDrive chassis.
- 2) Disassemble the plastic protector

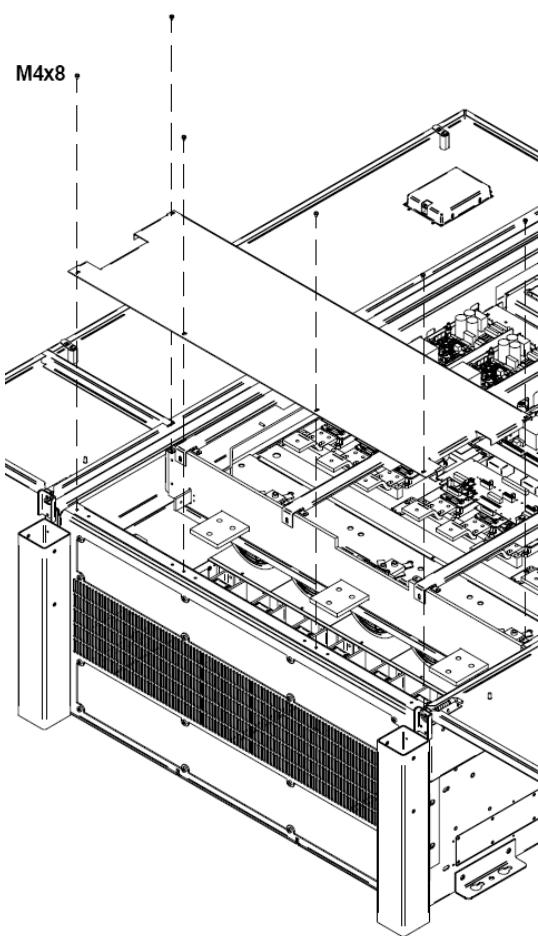


Figure 6.3 Disassembly of the plastic protector

7.8.2 UPPER COVER.

Disassembly of the Upper Cover

Follow *figure 6.4* while reading these instructions:

- 1) Unscrew the 12 Phillips **M4x8** DIN-7895H, which join the upper cover and the chassis of the SD700.
- 2) In IP20 models, disassemble the upper cover slowly and then disconnect the fans supply wire. Afterwards remove the Upper Cover

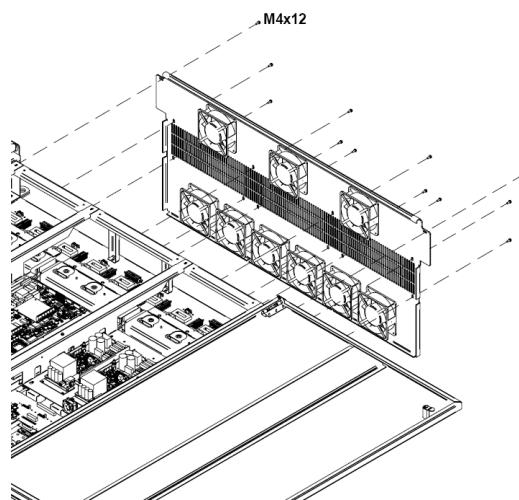


Figure 6.4 Disassemble upper cover

Assembly of the plastic protector

Place the plastic protector of the power terminals in the SDrive chassis by screwing the 6 Phillips **M4x8** DIN-7895H.

Assembly of the upper cover

- 1) In IP20 models, connect the fans supply wire.
- 2) Join the upper cover with SD700 chassis screwing on 12 Phillips screw **M4x8** DIN-7895H.

7.8.3 CONTROL BOARD

Disassembly of the Control Board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 6.5 while reading these instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control PCB and the plastic hexagonal spacers **M3x20**.
- 2) Disassemble the Control Board by removing the 40, 32 y 28 pin connectors, which join the Control Board and the Power Board.
- 3) When the control Board has been disassembled, place it in a static proof bag for safekeeping.

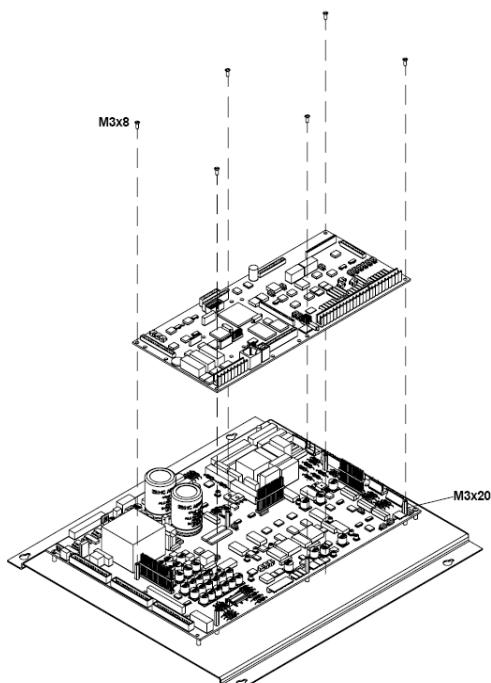


Figure 6.5 Disassembly of the Control Board

Assembly of the Control Board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new Control Board.
- 2) Place the new Control Board on the hexagonal spacers **M3x20**.
- 3) Push the 40, 32 y 28 pins connectors down. Do not apply excessive force.
- 4) Screw the 6 plastic screws **M3x8** DIN-933 in the plastic hexagonal spacers **M3x20**

7.8.4 POWER BOARD

Disassembly of the Power Board

Before proceeding, the Control Board must have been disassembled (section 7.8.3).

Follow figure 6.6 (a) and figure 6.6 (b) while reading these instructions:

- 1) Disconnect all the wires which are connect to this Board.

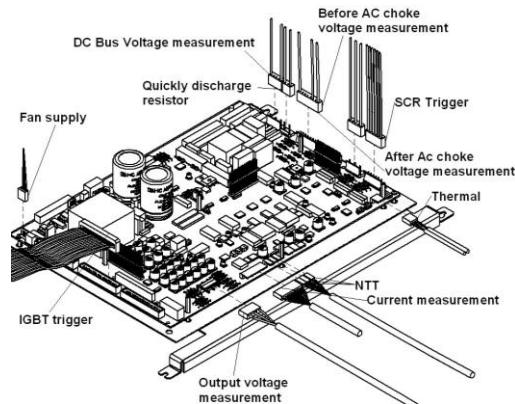


Figure 6.6 (a) Disassembly of the Power Board wires.

- 2) Remove the 6 plastic hexagonal spacers **M3x20**, which are inserted in the Power Board.
- 3) Unscrew the 5 Phillips screws **M3x8** DIN-7895H.
- 4) Disassemble the Power Board.

Assembly of the Power Board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new Control Board.
- 2) Place the new board on the electric tray and fit the holes of the board with the electric tray bolts. (*figure 6.6(a)*)
- 3) Screw the 5 Phillips screws **M3x8 DIN-7895H** to the electric tray bolts.
- 4) Connect the power board wiring. (*figure 6.6(a)*).

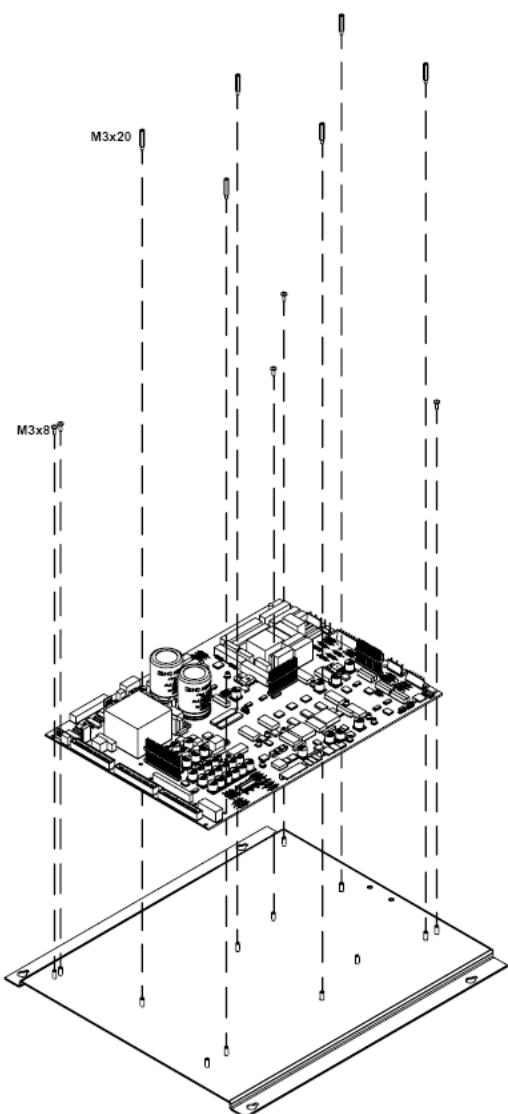


Figure 6.6 (b). Disassembly of the Power Board.

7.8.5 DRIVE SELECT AND IGBT SELECTION MODULE**Disassembly of the Drive Select**

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 6.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8 DIN-933**, which join this Board and the plastic hexagonal spacers **M3x13**.

Assembly of the IGBT selection module

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 6.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8 DIN-933**, which join this Board and the plastic hexagonal spacers **M3x13**.

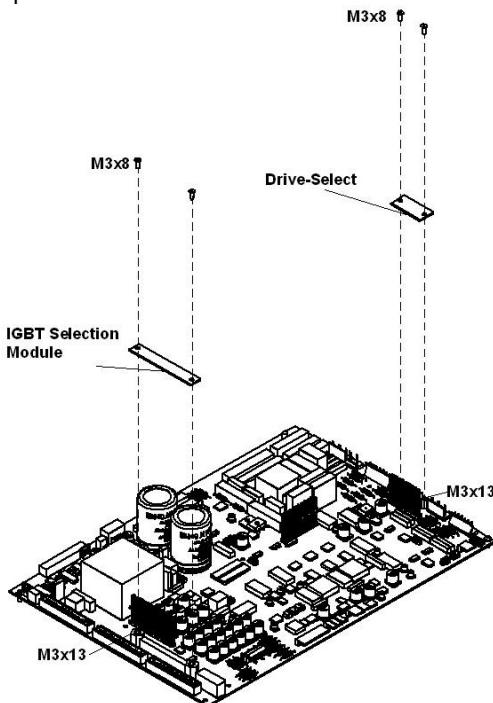


Figure 6.7. Disassembly of the Drive-select and IGBT selection module

Assembly of Drive Select

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8 DIN-933**.

Assembly of IGBT selection module

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8 DIN-933**.

7.8.6 SNUBBER, TRIGGER AND SOFT CHARGE PROTECTION BOARD

Disassembly of the Snubber, trigger and soft charge protection board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 6.8 (a), figure 6.8 (b) and figure 6.8 (c) while reading these instructions:

- 1) Disconnect the voltage measure cable before and after the AC Choke by unscrewing the Phillips screw **M4x8 DIN-7895H**, which join the wire terminals and the board (figure 6.8(a))
- 2) Disconnect all output wiring (figure 6.8(b)).

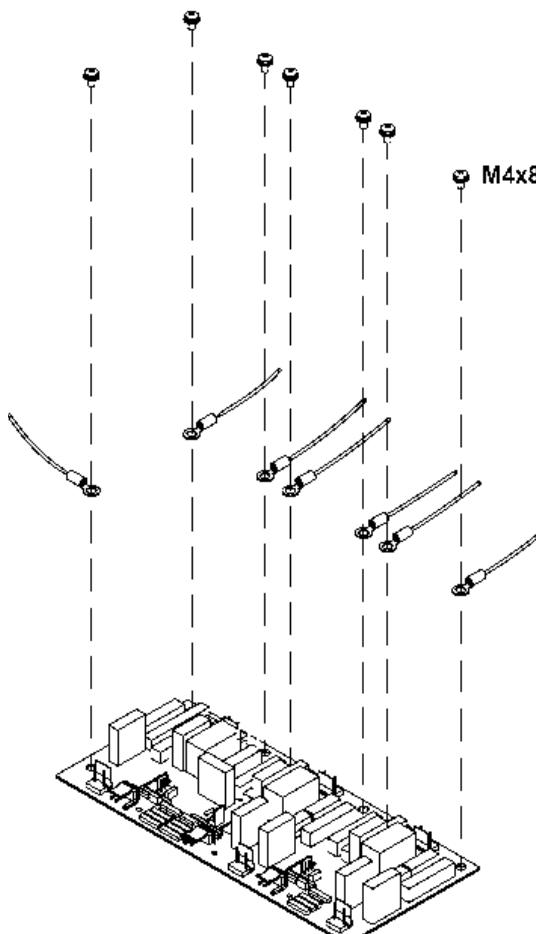


Figure 6.8.(a) Disassembly of the Snubber, Trigger and Soft charge protection

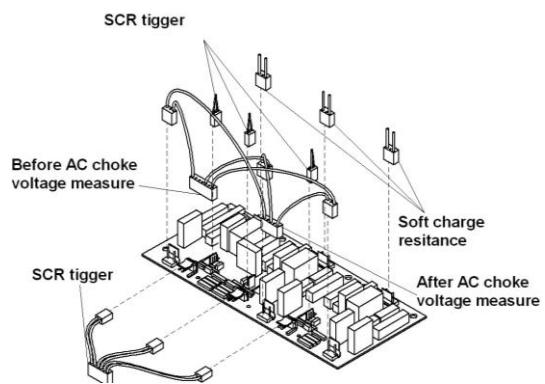


Figure 6.8. (b) Disassembly of the Snubber, Trigger and Soft charge protection

- 3) Unscrew the 3 Phillips screws on **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**, placed in the Bus (+).
- 4) Unscrew the 3 Phillips screw **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**, placed in the Bus(+).
- 5) Disassemble the Board.

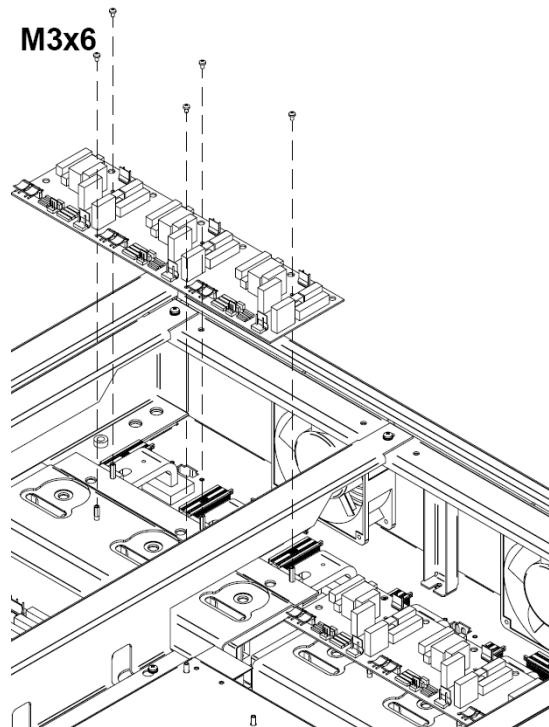


Figure 6.8. (c) Disassembly of Snubber, Trigger and Soft charge protection

Assembly of Snubber, trigger and soft charge protection board

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the Board in the position shown in figure 6.8 (c).
- 3) Screw the 3 screw **M3x8** DIN-7895H, which join the board and the hexagonal spacers **M3x10**.
- 4) Screw the 3 Phillips screws **M3x8** DIN-7895H, which join this board and the hexagonal spacers **M3x15**.
- 5) Connect all input wiring (voltage measure wire before and after the AC Choke voltage measurement) by screwing the Phillips screw **M4x8** DIN-7895H, which join the wire terminals and the board (*figure 6.8 (a)*)
- 6) Connect all output wiring. (*figure 6.8 (b)*)

7.8.7 FANS POWER SUPPLY.

Disassembly of the fan power supply

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 6.9 while reading these instructions:

- 1) Disconnect the 2 fan power wires, and power wire of the fans power supply.
- 2) Unscrew the 3 Phillips screws **M3x6** DIN-7895H, which join the fan power supply and the fans tray.
- 3) Remove the fan power supply.

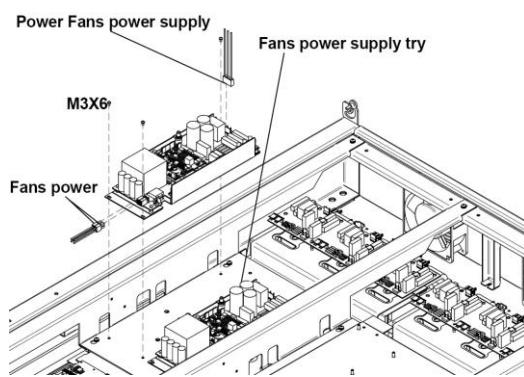


Figure 6.9. Disassembly of the fan power supply.

Assembly of the fans power supply

Continue to observe static safe work procedures.

- 1) Place the new fans power supply in the fan tray.
- 2) Screw the 3 Phillips screws **M3x6** DIN-7895H, which join the fans power supply and the fan tray.
- 3) Connect the 2 fan power wires and the fan power supply power wire.

7.8.8 OUTPUT CHOKES.

Disassembly of the Output choke

Follow figure 6.10 while reading these instructions:

- 1) Unscrew the 2 hexagonal screws **M8x25** DIN-933, which join the Output choke and the DCCT bar and output bar.
- 2) Disassemble the output choke

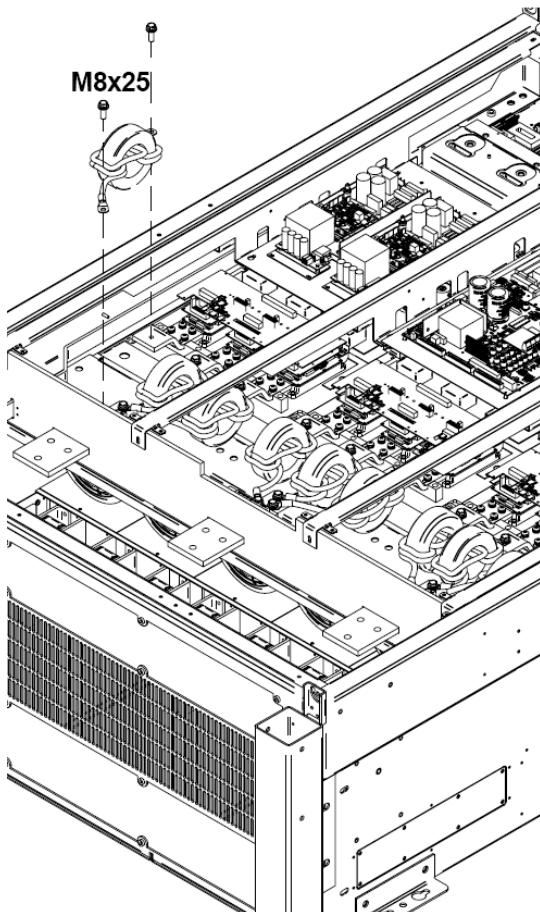


Figure 6.10. Disassembly of the output choke

Assembly of the Output choke

- 1) Insert the output choke as it is shown in figure 6.10
- 2) Connect the terminals of the wire of the output choke to the DCCT bar and the output bar by screwing the 2 hexagonal screws **M8x25** DIN 933.

7.8.9 DCCT

Disassembly of the DCCT

Before proceeding, output choke must have been disassembled (section 7.8.8).

Follow figure 6.11 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M4x12** DIN-7895H, which join DCCT and the DCCT support.
- 2) Disconnect current measure wire.
- 3) Disassemble the DCCT

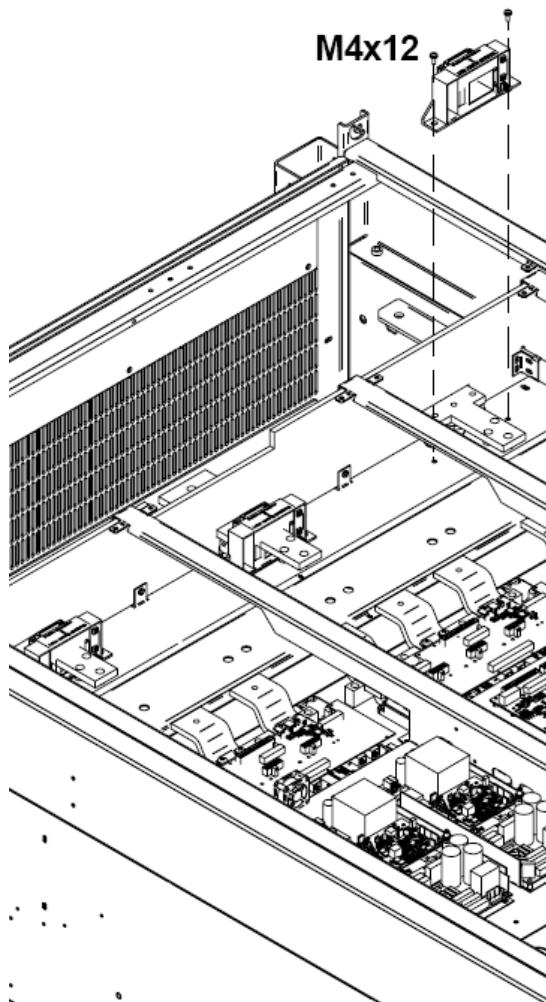


Figure 6.11. Disassembly of the DCCT

Assembly of the DCCT

- 1) Place the new DCCT
- 2) Join the DCCT and the DCCT support by screwing the 2 Phillips screws **M4x12** DIN-7895H.
- 3) Connect the current measure wire.

7.8.10 DC BUS

Disassembly of the DC Bus

Before proceeding, the Snubber, Trigger and Soft charge board must have been disassembled (*section 7.8.6*).

Follow figure 6.13 (a), figure 6.13 (b), figure 6.13 (c) and figure 6.13 (d) while reading these instructions:

- 1) Disassemble the electronic tray by unscrewing the 4 Phillips screws **M4x8 DIN-7895H**, which join this tray and the side of the chassis.
- 2) Disassemble the snubber capacitors by unscrewing he Phillips screws **M6x12 DIN-7895H**, which join the snubber capacitors and the DC Bus.
- 3) Disassemble the hexagonal spacers **M3x10** inserted in the DC Bus, and where the back of the snubber, trigger and soft charge Board leans
- 4) Disassemble the hexagonal spacers **M3x15** inserted in the DC Bus, where the front of the snubber, trigger and soft charge Board leans.
- 5) Unscrew the 8 Phillips **M6x16 DIN-7895H** screws, which join the DC Bus and the bus bridge.
- 6) Unscrew the 2 Phillips **M6x16 DIN-7895H** screws, which join the DC Bus and the Bus bar.
- 7) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the chassis
- 8) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger
- 9) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger
- 10) Unscrew the 6 Phillips screws **M6x12 DIN-7895H**, which join the Bus(+) and the Bus(-) with the 3 SCRs

Assembly of the DC Bus

- 1) Place the DC Bus in the chassis.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger.

- 3) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC BUS and the chassis.
- 4) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join DC Bus and the SCRs.
- 5) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join DC Bus and the SCRs.
- 6) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger.
- 7) Insert the plastic hexagonal spacers **M3x10** on the DC Bus where the back of Snubber, Trigger and Soft charge Board leans.
- 8) Insert the hexagonal spacers **M3x15** on the DC Bus, where the back of the Snubber, Trigger and Soft charge Board leans.
- 9) Place the Snubber capacitors on the back of the DC Bus (*see figure 3.15*) by screwing the Phillips screws **M6x12 DIN-7895H**.
- 10) Screw the 8 Phillips screws **M6x16 DIN-7895H**, which join the DC Bus and the Bus bridge.
- 11) Screw the 2 Phillips screws **M6x16 DIN-7895H**, which join the DC Bus and the Bus bridge
- 12) Insert the electronic tray by screwing the 4 Phillips screws **M4x8 DIN-7895H**.

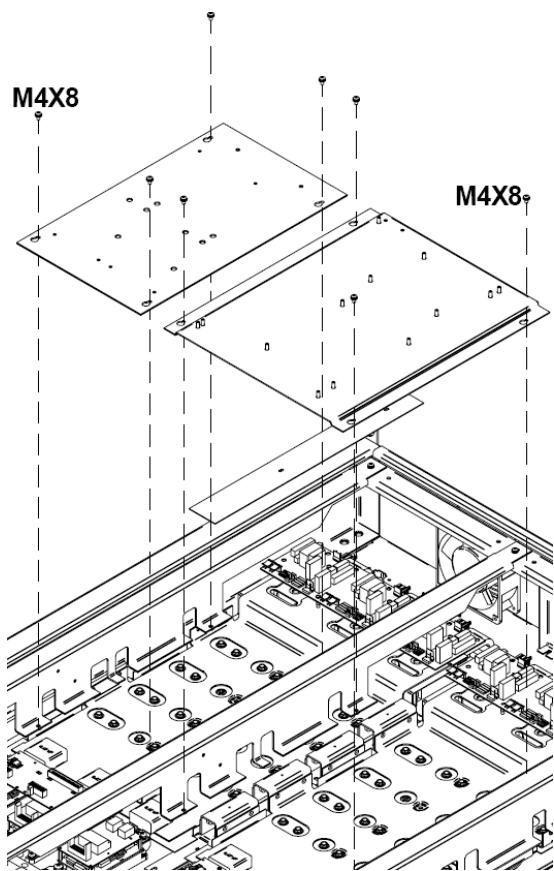


Figure 6.12 (a) Disassembly of the DC Bus.

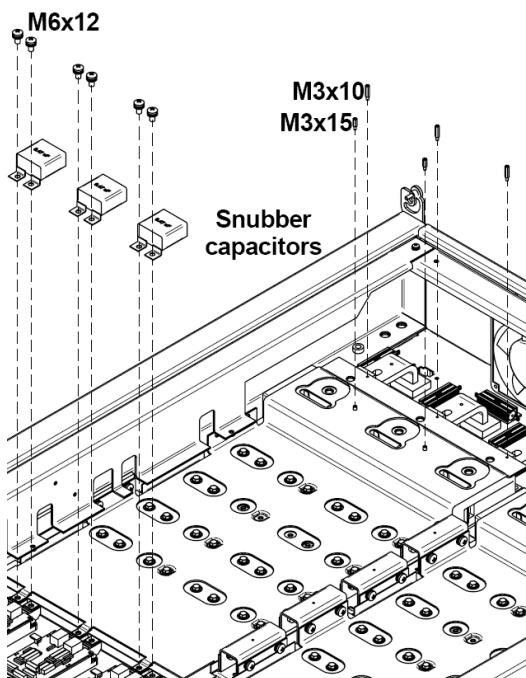


Figure 6.12. (b) Disassembly of the DC Bus

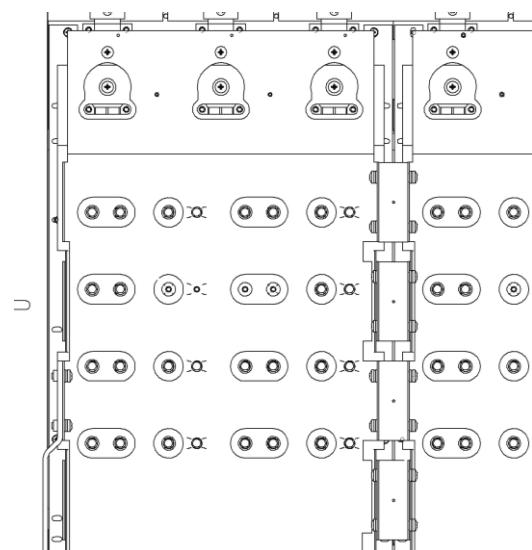


Figure 6.12. (c) Bus bridge.

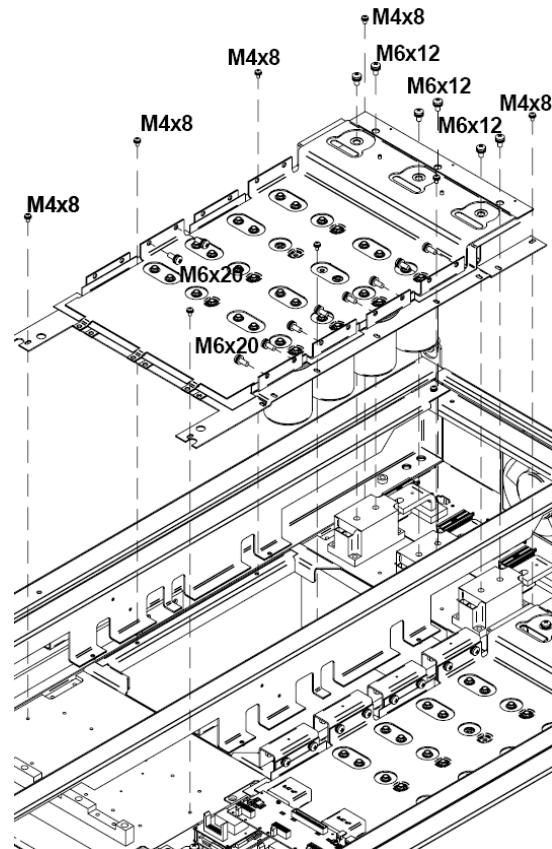


Figure 6.12. (d) Disassembly of the DC Bus

7.8.11 BUS CAPACITORS

Before proceeding, the DC Bus must have been disassembled. (section 7.8.10).

Follow *figure 6.13* while reading these instructions:

Disassembly of the Bus capacitors

- 1) Unscrew the special hexagonal screws **M5x20**, which join the capacitor and the Bus(+).
- 2) Remove the Bus(+)
- 3) Remove the Bus (+) and the Bus(-) insulator.
- 4) Unscrew the special hexagonal screws **M5x20**, which join the capacitor and the Bus (-).
- 5) Remove the Bus (-).
- 6) Remove the Bus(-) and the middle Bus insulator.
- 7) Unscrew the special hexagonal screws **M5x20**, which join the middle Bus and the capacitors.
- 8) Remove the middle Bus.
- 9) Take out the capacitors of their rings.

Assembly of the Bus capacitors

- 1) Place the new capacitors in their rings.
- 2) Insert the middle Bus (*figure 6.13*).
- 3) Screw the special hexagonal screws **M5x20**.
- 4) Insert the Bus(-) and the middle Bus insulator.
- 5) Insert the Bus (-) (*figure 6.13*).
- 6) Screw the special hexagonal screws **M5x20**, which join the Bus (-) and the capacitors.
- 7) Place the Bus (+) and the Bus (-) insulator.
- 8) Insert the Bus (+) (*figure 6.13*).
- 9) Screw special hexagonal screws **M5x20**, which join the Bus (+) and the capacitors.

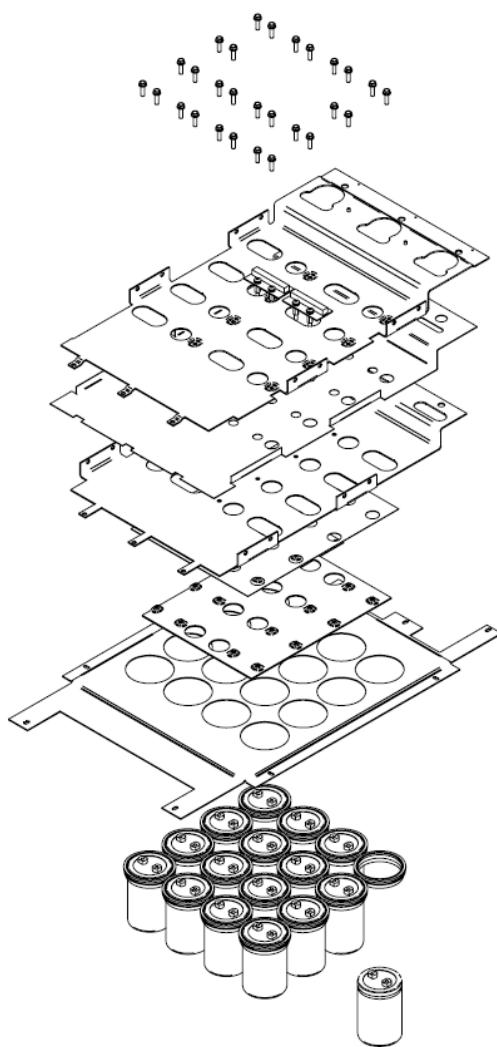


Figure 6.13. Disassembly of the Bus capacitors.

7.8.12 IGBTs CONNECTOR BOARD

Disassembly of the IGBTs connector board.

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 6.14* while reading these instructions:

- 1) Disconnect the IGBT trigger wire, which connects this board to the Power board
- 2) Disconnect the 3 NTC wires, which connect this board to the upper Gate Drive
- 3) Unscrew the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 4) Unscrew the 2 slotted cheese head screws **M3x30** DIN-84, which join this Board and the Upper Gate Drives.
- 5) Remove the IGBTs connector board. The plastic hexagonal spacers and the Nylon cases are not fixed anywhere, they are simply holding this board. Take care of not loosing them when the board is disassembled

Assembly of the IGBTs connector board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the new board on the plastic hexagonal spacers **M3x18** and the Nylon cases.
- 3) Screw the 2 slotted cheese head screws **M3x30** DIN-84, which are inserted into the Nylon cases and are joined to the hexagonal spacers **M3x18**, located under the upper Gate Drive.
- 4) Screw the 2 plastic screws **M3x6** DIN-933, which join this board and the plastic hexagonal spacers **M3x18**.
- 5) Connect the IGBT trigger wire.
- 6) Connect the NTC wires.

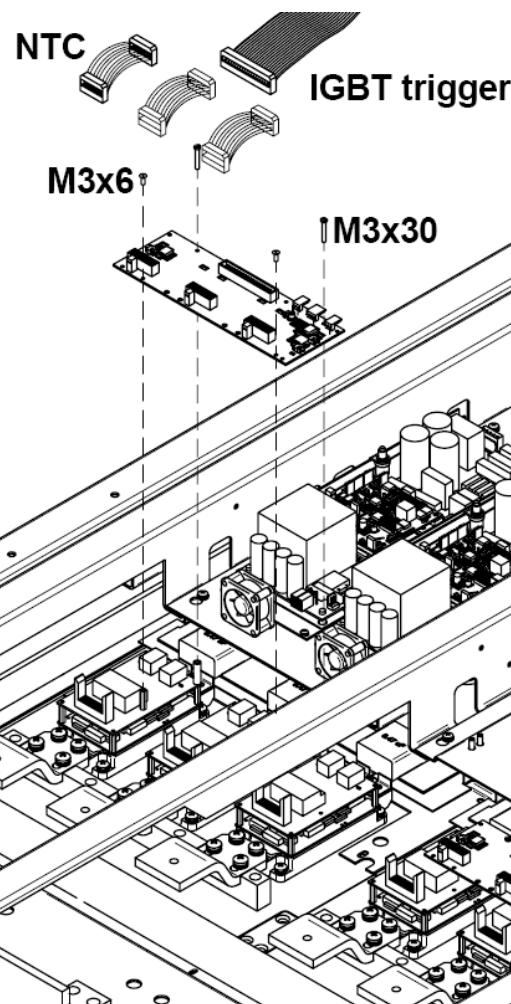


Figure 6.14. Disassembly of the IGBT Connector Board

7.8.13 UPPER GATE DRIVE

Disassembly of upper Gate Drive

Before proceeding, the IGBTs connector board must have been disassembled. (section 7.8.12).

Follow *figure 6.15* while reading these instructions:

- 1) Disconnect the phone wires, which connect this board to the lower Gate Drive.
- 2) Unscrew the Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 3) Disassemble the Upper Gate Drive.

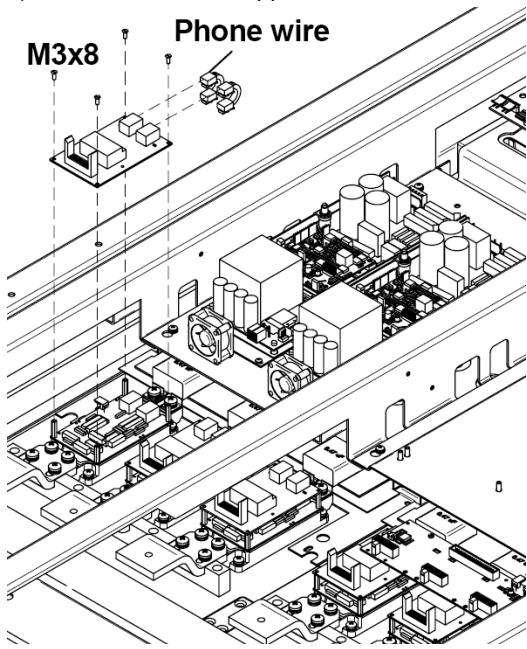


Figure 6.15. Disassembly of the Upper Gate Drive

Assembly of the Upper Gate Drive

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Place the new board on the hexagonal spacers **M3x18**. (*figure 5.15*).
- 3) Screw the 3 Phillips screws **M3x8 DIN-7895H**, which join this board and the hexagonal spacers **M3x18**.
- 4) Connect the phone wires.

7.8.14. IGBT

Disassembly of the the IGBT

Before proceeding, the upper Gate Drive board must have been disassembled. (section 7.8.14).

Follow *figure 6.16 (a)* and *figure 6.16 (b)* while reading these instructions:

- 1) Unscrew the 4 hexagonal spacers **M3x18**, where the Upper Gate Drive is inserted.
- 2) Unscrew the 2 Phillips screws **M6x12 DIN-7895H**, which join the Snubber capacitors and the IGBTs.
- 3) Remove the DC Bus (section 7.8.10).
- 4) Remove the snubber capacitors
- 5) Unscrew the 3 Phillips screws **M6x20 DIN-7895H**, which join the IGBT and the bar, where the DCCTs are screwed.
- 6) Remove the bar where the DCCTs are screwed.
- 7) Unscrew the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 8) Disassemble the IGBT.

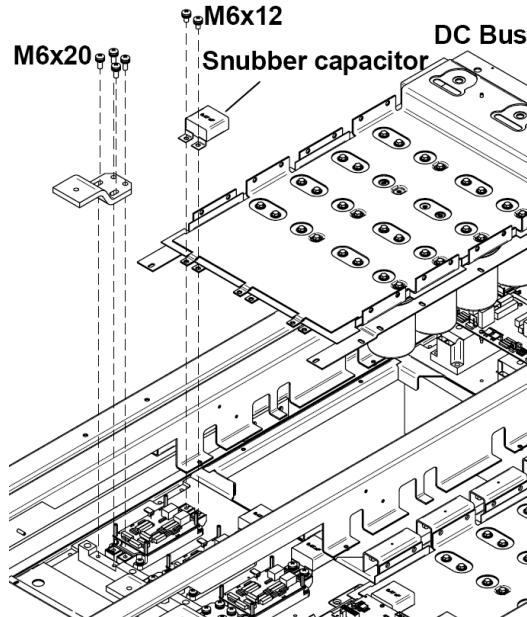


Figure 6.16. (a) Disassembly of the IGBT

Assembly of the IGBT

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Take out the new IGBT of the static box.
- 3) Spread the thermal paste over the back of the IGBT.
- 4) Place the IGBT on the heat exchanger.
- 5) Screw the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 6) Place the DCCT Bar as it is shown in *figure 6.16*.
- 7) Insert the DC Bus (*section 7.8.10*).
- 8) Place the Snubber capacitor on the DC Bus.

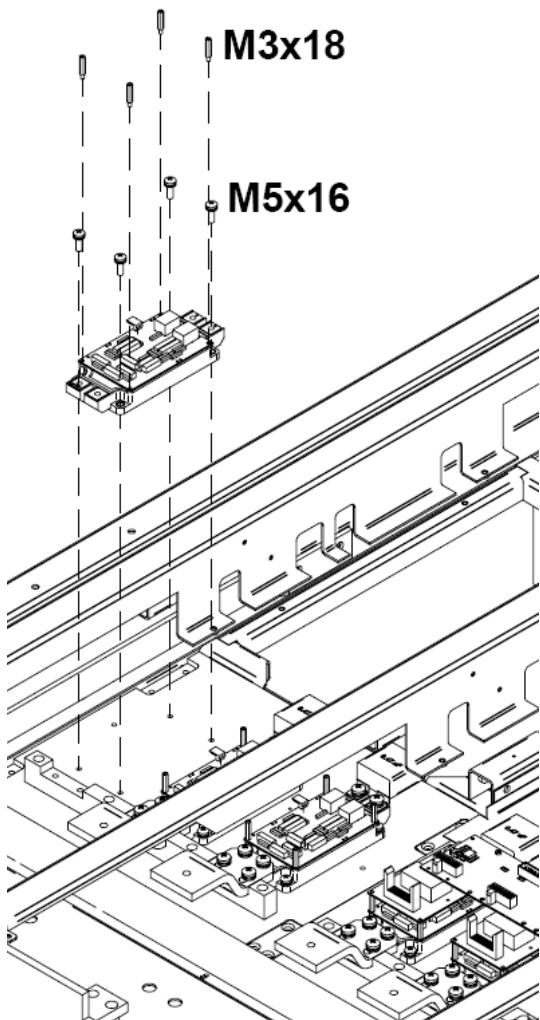


Figure 6.16. (b) Disassembly of the IGBT

7.8.15 SCRs**Disassembly of the SCRs**

Before proceeding, the Upper cover (*section 7.8.2*), the Snubber Trigger and Soft charge board (*section 7.8.6*), and the DC Bus (*section 7.8.10*) must have been disassembled.

Follow *figure 6.17(a)* and *figure 6.17(b)* while reading these instructions:

- 1) Unscrew the hexagonal screws **M8x25 DIN-933**, which join the bars and the SCRs.
- 2) Remove voltage measure wires after the AC choke by unscrewing the Phillips screws **M4x8 DIN-7895H**, which join these wires and the bars.
- 3) Remove the bars.

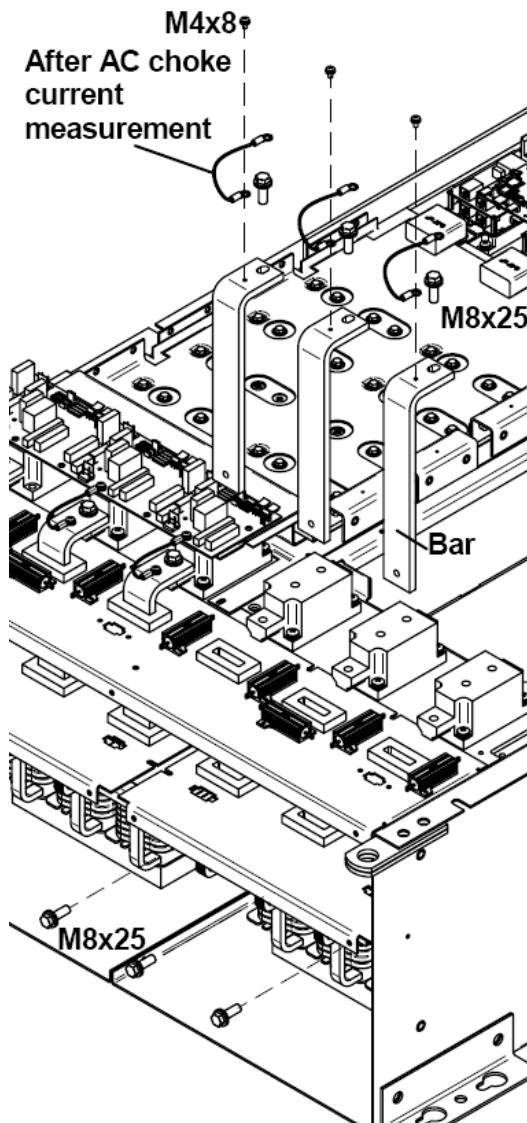


Figure 6.17(a). Disassembly of the SCR

- 4) Unscrew the 2 Phillips screws **M5x12 DIN-7895H** which join the SCR and the heat exchanger.
- 5) Disassemble the SCR.

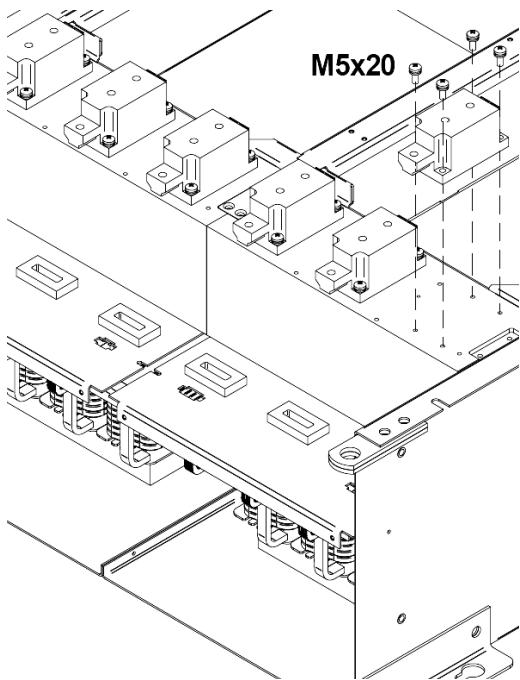


Figure 6.17(b). Disassembly of the SCR

Assembly of the SCRs

- 1) Spread the thermal paste over the back of the new SCR.
- 2) Insert the SCR in the heat exchanger (*figure 6.17*).
- 3) Screw the 2 Phillips screws **M5x12 DIN-7895H**, which join the SCR and the heat exchanger.
- 4) Insert the bars (*figure 6.17(a)*)
- 5) Insert the voltage measure wires after the AC Choke by unscrewing the Phillips screws **M4x8 DIN-7895H**, which join their wires and the bars.
- 6) Screw the Phillips screws **M6x20 DIN-7895H**, which join the bars and the AC Choke.
- 7) Screw Phillips screws **M6x16 DIN-7895H**, which join the bars and the SCRs.

7.8.16 POWER FAN

Disassembly of the Fan support

Follow *figure 6.18* while reading these instructions:

- 1) Unscrew the Phillips screw **M4x8 DIN-7895H**, which join the fan support and the fan box.
- 2) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Disconenct the fan power wire.
- 4) Remove the fan support.

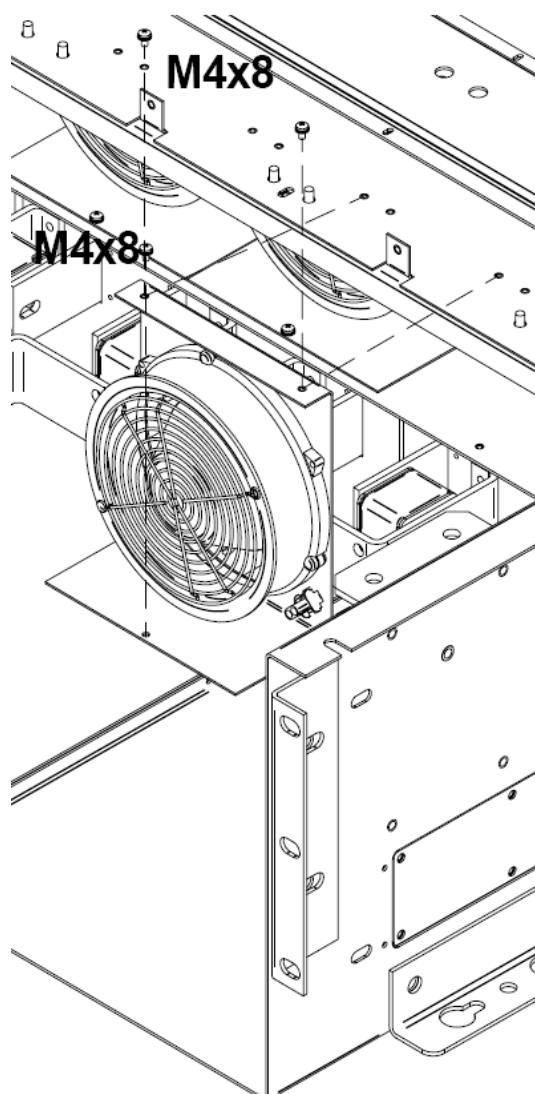


Figura 6.18. Disassembly of the Power Fan

24VDC, 2A, 48W, 172X172 FAN

Follow *figure 6.19 (a)* while reading these instructions:

Unscrew the 2 slotted cheese head screws **M4x60** DIN-84, which join the power fan and its support.

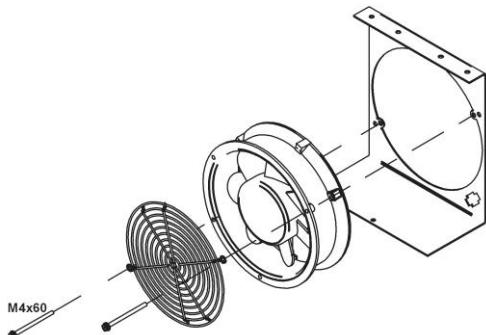


Figure 6.19 (a) . Disassembly of the fan support

24VDC, 89W, 172X172 FAN

Follow *figure 6.19 (b)* while reading these instructions:

Unscrew the 2 Phillips screws **M4x12** DIN-7895H, which join the power fan with its support.

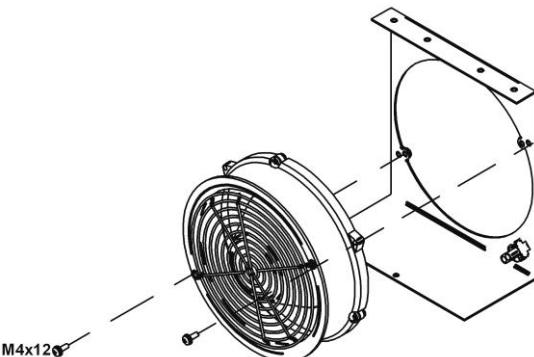


Figure 6.19 (b) . Removing fan support

Assembly of the Fan power support

- 1) Before inserting the fan support in the fan box, connect the fan power wire.
- 2) Screw the 2 Phillips screws **M4x8** DIN-7895H, which join the fan support and the output choke support.
- 3) Screw the Phillips **M4x8** DIN-7895H, which join the fan support and the fan box.

7.8.17 AC CHOKEDisassembly of the AC Choke

Before proceeding, the bars, which join the AC choke and the SCRs (section 7.8.15) and the Upper cover (section 7.8.2) must have been disassembled.

Follow *figure 6.20* while reading these instructions:

- 1) Unscrew the 4 Phillips screws **M6x16** DIN-7895H, which join the AC choke and the chassis.
- 2) Remove the AC choke out of the chassis, and disconnect the 3 power wires by unscrewing the hexagonal screws **M8x25** DIN-961, which join the power wires and the AC choke.
- 3) Disassemble the AC choke.

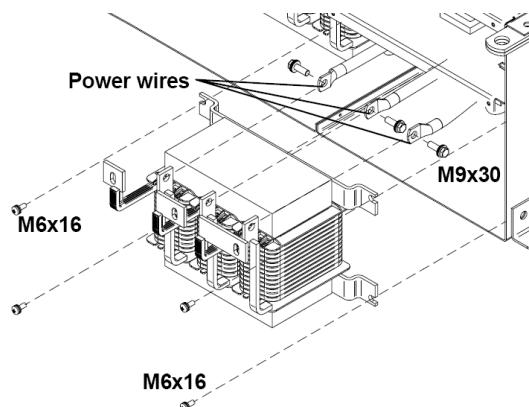


Figure 6.20. Disassembly of the AC choke

Assembly of the AC choke

- 1) Place the AC choke near to the chassis and connect the power wires by screwing the hexagonal screws **M8x25** DIN-961.
- 2) Place the AC choke in the chassis and screw the 4 Phillips screws **M6x16** DIN-7895H, which join the AC choke and the chassis.

7.9. SD700 FRAME 8.

7.9.1 ACCESS INSIDE.

Disassembly of the covers

Follow figure 7.1 y la figura 7.2 while reading these instructions:

- 1) Open the SDrive door.
- 2) Disconnect the Display from the Control Board.
- 3) Disconnect all control terminals (analogue inputs, digital inputs, PTC...).

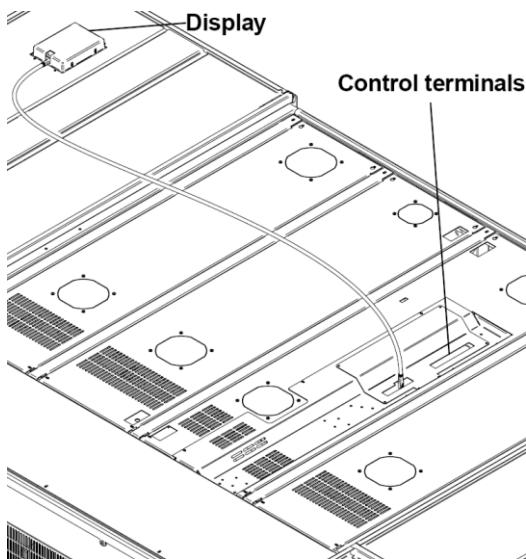


Figure 7.1 Disconnect the Display and the control terminals

- 4) Unscrew the 9 Phillips screws **M4x12 DIN-7895H**, which join the cover and the chassis upper part.
- 5) Unscrew the 9 Phillips screws **M4x8 DIN-7895H**, which join the cover and the lower part of the chassis.
- 6) In IP54 models, disconnect the fan power wires, which are in the covers before disassembling them.
- 7) Remove the covers.

Assembly of the SD700 Covers

- 1) Place the covers in the chassis as is shown in the *figure 7.2*.
- 2) Screw the 6 Phillips screws **M4x12 DIN-7895H**, which join the covers and the Upper part of the chassis.

- 3) Screw the 6 Phillips screws **M4x8 DIN-7895H** which, join the covers and the lower part of the chassis.
- 4) Connect the Display.

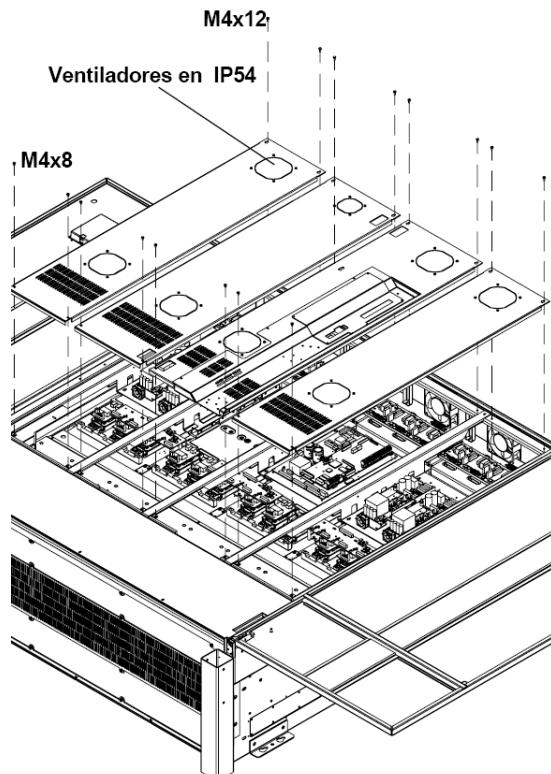


Figure 7.2 Disassembly of the covers

Disassembly of the plastic protector

- 1) Unscrew the 7 Phillips **M4x8 DIN-7895-H**, which join the plastic protector and the SDrive chassis.
- 2) Remove the plastic protector.

Assembly of the plastic protector

Place the plastic protector of the power terminals in the SDrive chassis by screwing the 7 Phillips **M4x8 DIN-7895H**.

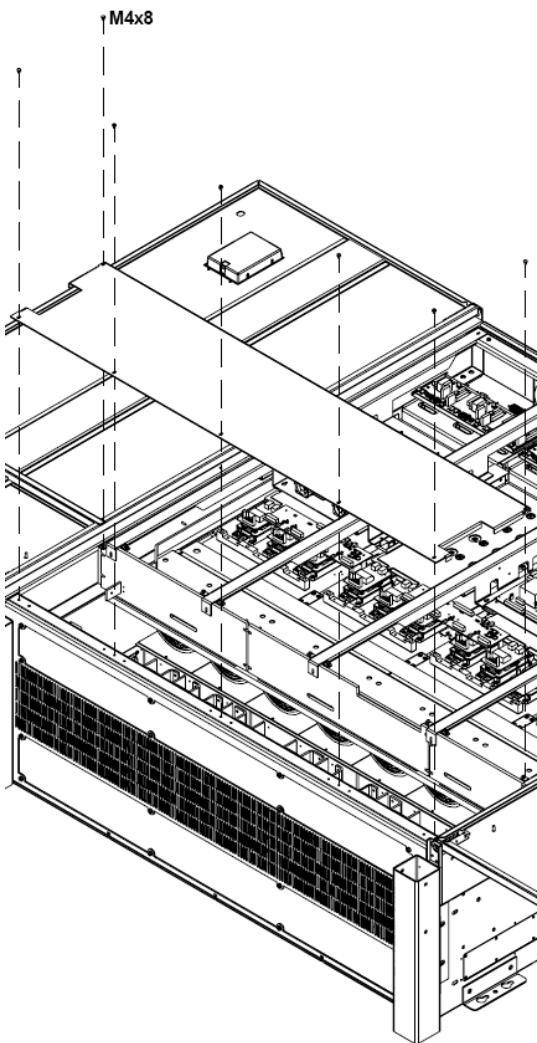


Figure 7.3 Assembly of the plastic protector.

7.9.2 UPPER COVER

Disassembly of the Upper cover

Follow figure 7.4 while reading these instructions:

- 1) Unscrew the 14 Phillips **M4x8** DIN-7895H, which join the Upper cover and the SD700 chassis.
- 2) In IP20 models, Disassemble the upper cover slowly in order to disconnect the fans supply wire.

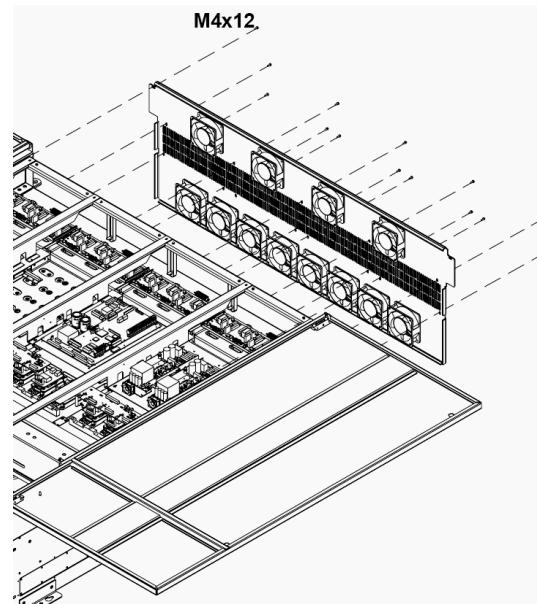


Figure 7.4 Disassemble the upper cover.

Assembly of the Upper cover

- 1) In IP20 models, connect the fan supply wire.
- 2) Join the upper cover and the SD700 chassis by screwing the 14 Phillips screw **M4x8** DIN-7895H.

7.9.3 CONTROL BOARD

Disassembly of the Control Board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 7.5 while reading these instructions:

- 1) Unscrew the 6 plastic screws **M3x8** DIN-933, which join the control PCB and the plastic hexagonal spacers **M3x20**.
- 2) Disassemble the Control Board by disconnecting the 40, 32 y 28 pin connectors, which join the Control Board and the Power Board.
- 3) When the control Board is out, place it in a static proof bag for safekeeping.

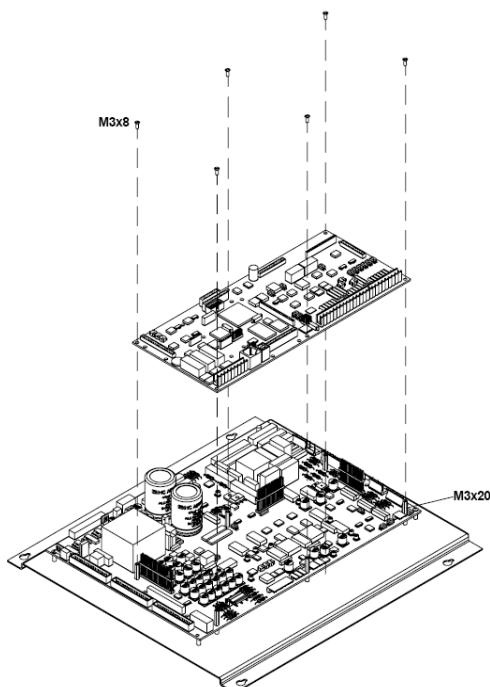


Figure 7.5 Disassembly of the Control Board

Assembly of the Control Board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new Control Board.
- 2) Place the new Control Board on the hexagonal spacers **M3x20** making the holes fit
- 3) Push the 40, 32 y 28 pins connectors down. Do not apply excessive force.
- 4) Screw the 6 plastic screws **M3x8** DIN-933 in the plastic hexagonal spacers **M3x20**

7.9.4 POWER BOARD

Disassembly of the Power Board

Before proceeding, the Control Board must have been disassembled (section 7.8.3).

Follow figure 7.6 (a) and figure 7.6 (b) while reading these instructions:

- 1) Disconnect all the wires, which are connected to this Board .

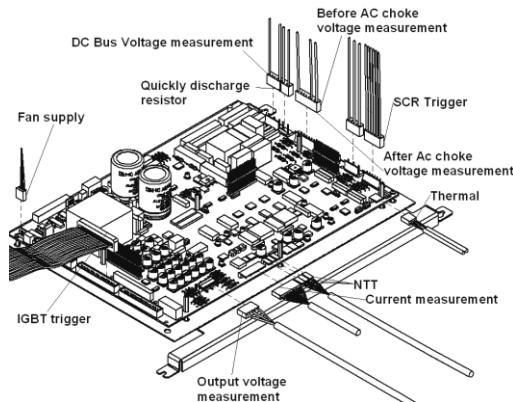


Figure 7.6 (a) Disassembly of the Power Board wires.

- 2) Remove the 6 plastic hexagonal spacers **M3x20**, which are inserted in the Power Board.
- 3) Unscrew the 5 Phillips screws **M3x8** DIN-7895H.
- 4) Disassemble the Power Board.

Assembly of the Power Board.

Continue to observe static safe work procedures.

Avoid an excessive handling of the new Control Board.

- 1) Put the new board on the electric tray and fit the holes with the electric tray bolts. (figure 7.6(a))
- 2) Screw the 5 Phillips screws **M3x8** DIN-7895H on the electric tray bolts.
- 3) Connect all the wiring of the Power board. (figure 7.6(a)).

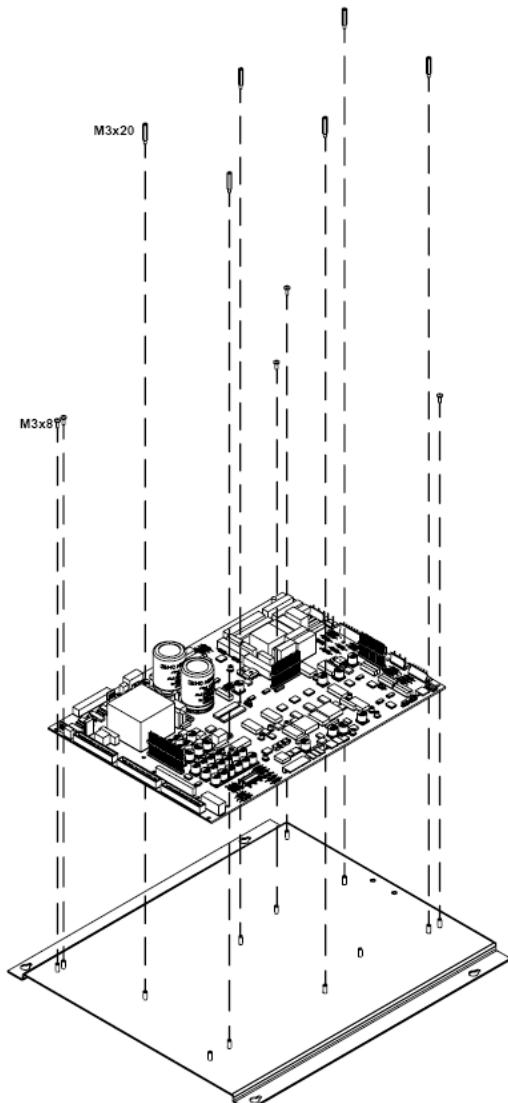


Figure 7.6 (b). Disassembly of the Power Board.

7.9.5 DRIVE SELECT AND IGBT SELECTION MODULE

Disassembly of the Drive Select

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 7.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

Assembly of the IGBT selection module

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 7.7 while reading these instructions:

Unscrew the 2 plastic screws **M3x8** DIN-933, which join this Board and the plastic hexagonal spacers **M3x13**.

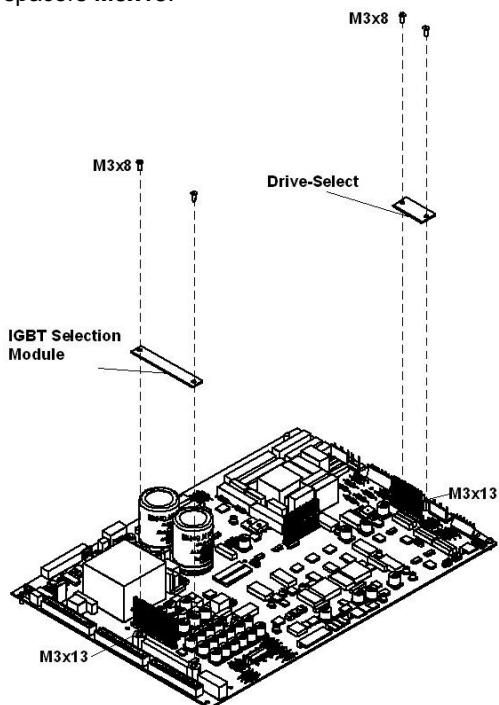


Figure 7.7. Disassembly of the Drive-select and the IGBT selection module

Disassembly of the Drive Select

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

Assembly of the IGBT selection module

Place the Board on the 2 plastic hexagonal spacers **M3x13** and screw the 2 plastic screws **M3x8** DIN-933.

7.9.6 SNUBBER, TRIGGER AND SOFT CHARGE PROTECTION BOARD

Disassembly of the Snubber, Trigger and Soft charge protection board

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 7.8 (a), figure 7.8 (b) and figure 7.8 (c) while reading these instructions:

- 1) Disconnect the voltage measure wire before and after the AC Choke by unscrewing the Phillips screws **M4x8 DIN-7895H** which join the wire terminals and the board (figure 7.8(a))
- 2) Disconnect all output wiring (figure 7.8 (b)).

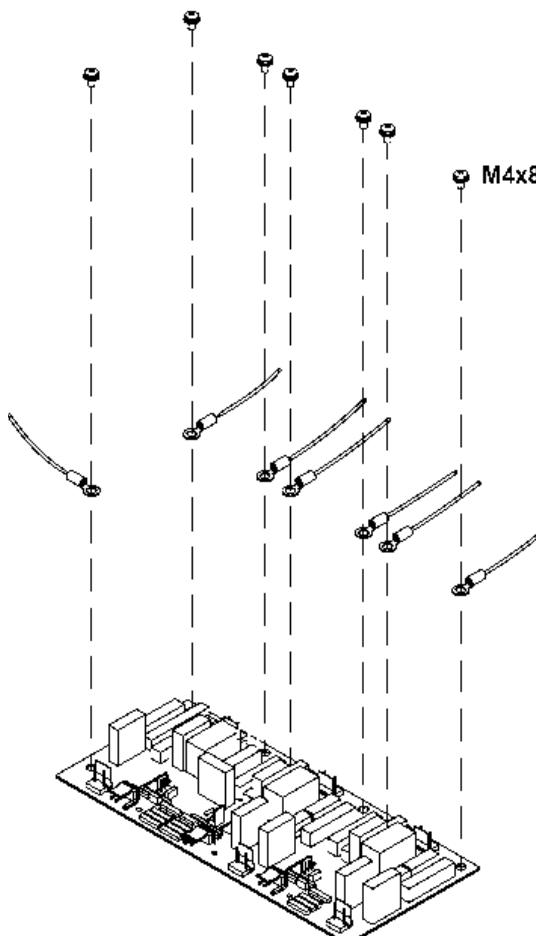


Figure 7.8.(a) Disassembly of the Snubber, Trigger and soft charge protection

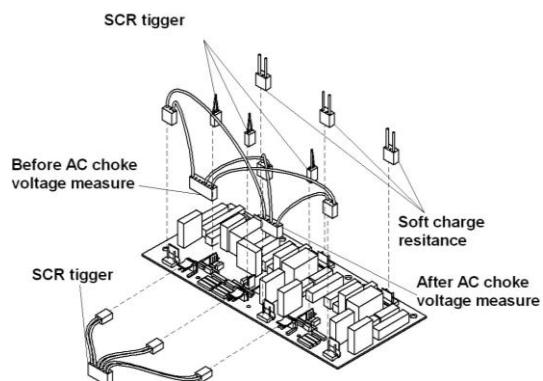


Figure 7.8. (b) Disassembly of the Snubber, Trigger and Soft charge protection

- 3) Unscrew the 3 Phillips screws on **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**, which are placed in the Bus(+).
- 4) Unscrew the 3 Phillips screw **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**, which are placed in the Bus(+).
- 5) Disassemble the Board.

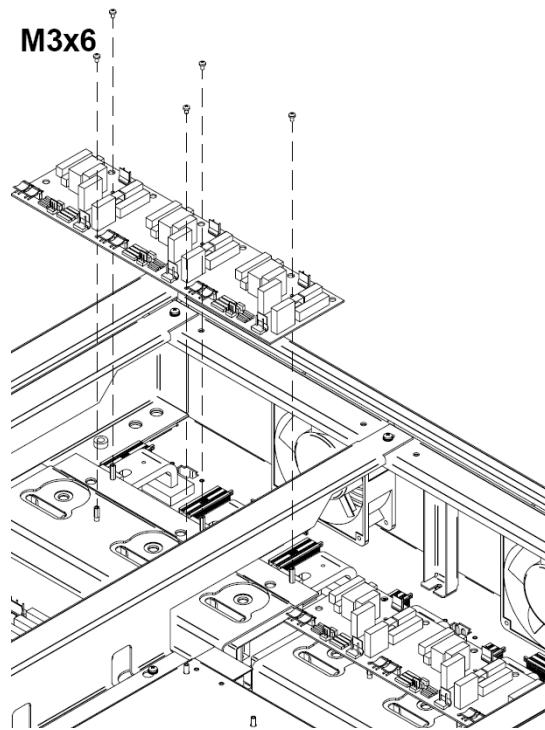


Figure 7.8. (c) Disassembly of the Snubber, Trigger and Soft charge protection

Assembly of the Snubber, trigger and soft charge protection board

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Put the Board in the position as it is shown in figure 7.8 (c).
- 3) Screw the 3 screws **M3x8 DIN-7895H**, which join the board and the hexagonal spacers **M3x10**.
- 4) Screw the 3 Phillips screws **M3x8 DIN-7895H**, which join this board and hexagonal spacers **M3x15**.
- 5) Connect all input wiring (voltage measure wire before and after the AC Choke), by screwing the Phillips screw **M4x8 DIN-7895H**, which join the wire terminals and the board (figure 7.8 (a))
- 6) Connect all output wiring. (figure 7.8 (b))

7.9.7 FANS POWER SUPPLY.

Disassembly of the fans power supply

The use of a static grounding wrist strap and being earthed is highly required.

Follow figure 7.9 while reading these instructions:

- 1) Disconnect the 2 fans power wires, and the power wire of the fans power supply.
- 2) Unscrew the 3 Phillips screws **M3x6 DIN-7895H**, which join the fans power supply and the fan tray.
- 3) Remove the fan power supply.

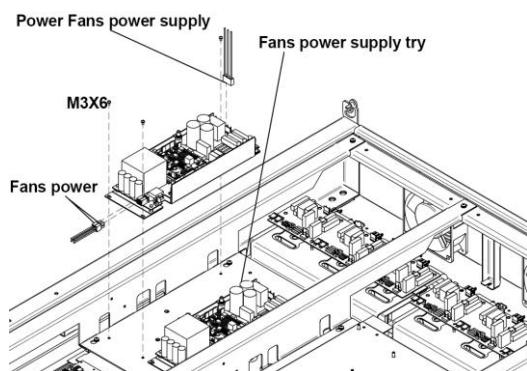


Figure 7.9. Disassembly of the fans power supply.

Assembly of the fans power supply

Continue to observe static safe work procedures.

- 1) Put the new fans power supply in the fan tray.
- 2) Screw the 3 Phillips screws **M3x6 DIN-7895H**, which join the fans supply power and the fan tray.
- 3) Connect the 2 fans power wires and the fan power supply power wire .

7.9.8 OUTPUT CHOKES.

Disassembly of the output choke

Follow figure 7.10 while reading these instructions:

- 1) Unscrew the 2 hexagonal screws **M8x25** DIN-933, which join the output choke and the DCCT bar and output bar.
- 2) Disassemble the output choke

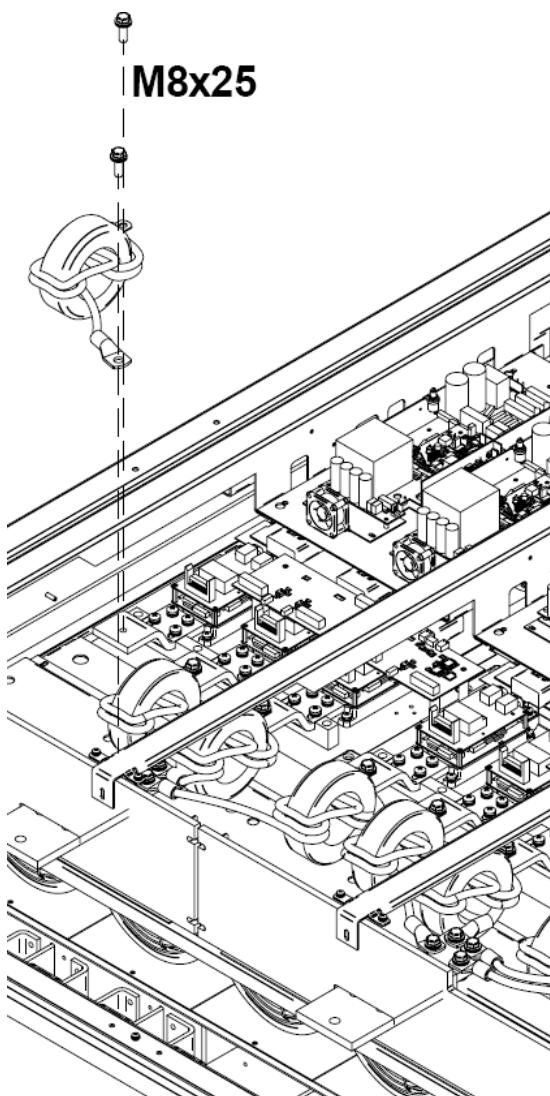


Figure 7.10. Disassembly of the output choke

Assembly of the output choke

- 1) Insert the output choke as it is shown in figure 7.10
- 2) Connect the terminals of the output choke wire to the DCCT bar and output bar, by screwing the 2 hexagonal screws **M8x25** DIN 933.

7.9.9 DCCT

Disassembly of the DCCT

Before proceeding, output choke must have been disassembled (section 7.9.8).

Follow figure 7.11 while reading these instructions:

- 1) Unscrew the 2 Phillips screws **M4x12** DIN-7895H, which join DCCT and the DCCT support.
- 2) Disconnect the current measure wire.
- 3) Disassemble the DCCT

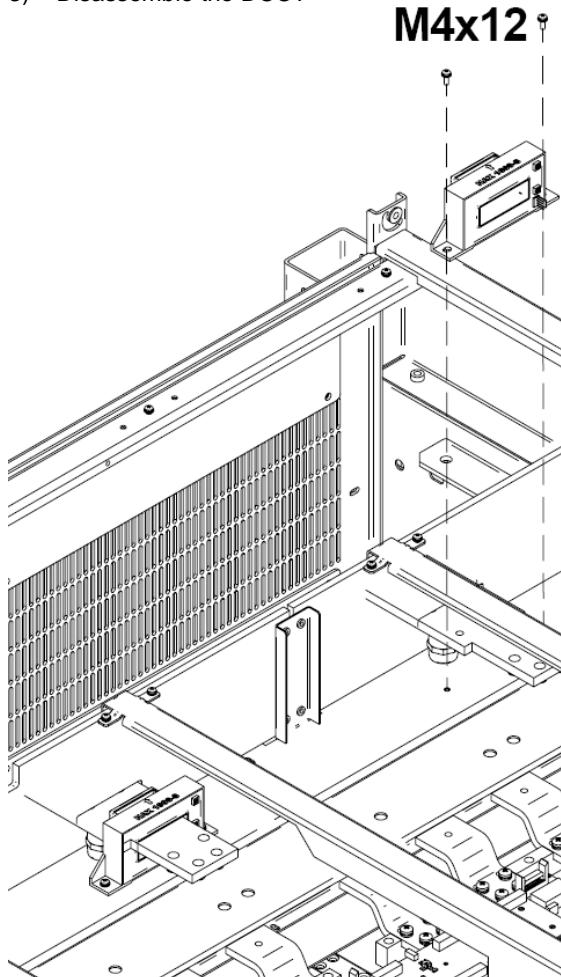


Figure 7.11. Disassembly of the DCCT

Assembly of the DCCT

- 1) Put the new DCCT in the place of the old DCCT.
- 2) Join the DCCT and the DCCT support by screwing the 2 Phillips screws **M4x12** DIN-7895H.
- 3) Connect the current measure wire

7.9.10 DC BUS

Disassembly of the DC Bus

Before proceeding, snubber, trigger and soft charge board must have been disassembled (*section 7.9.6*).

Follow figure 7.12 (a), figure 7.12 (b), figure 7.12 (c), figure 7.12 (d) and figure 7.12 (e) while reading these instructions:

- 1) Remove the electronic tray by unscrewing the 4 Phillips screws **M4x8 DIN-7895H**, which join this tray and the sides of the chassis.
- 2) Remove the Snubber capacitors by unscrewing the Phillips screws **M6x12 DIN-7895H**, which join the snubber capacitors and the DC Bus.
- 3) Remove the hexagonal spacers **M3x10** inserted in the DC Bus where the back of the Snubber, Trigger and Soft charge Board leans.
- 4) Remove the hexagonal spacers **M3x15** inserted in the DC Bus, where the front of the Snubber, Trigger and Soft charge Board.
- 5) Unscrew the 8 Phillips **M6x20 DIN-7895H** screws, which join the DC Bus and the bus bridge.
- 6) Unscrew the 2 Phillips **M6x20 DIN-7895H** screws, which join the DC Bus and the Bus bar.
- 7) Unscrew the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the chassis
- 8) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger
- 9) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger
- 10) Unscrew the 6 Phillips screws **M6x12 DIN-7895H**, which join the Bus(+) and the Bus(-) to the 3 SCRs
- 3) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC BUS and the chassis.
- 4) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join DC Bus and the SCRs.
- 5) Screw the 6 Phillips screws **M6x12 DIN-7895H**, which join the DC Bus and the SCRs.
- 6) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the SCRs heat exchanger.
- 7) Insert the plastic hexagonal spacers **M3x10** on the DC Bus, where the back of the Snubber, Trigger and Soft charge Board leans.
- 8) Insert the hexagonal spacers **M3x15** on the DC Bus, where the back of the Snubber, Trigger and Soft charge Board leans.
- 9) Put the Snubber capacitors on the back of the DC Bus (see *figure 3.15*) by screwing the Phillips screws **M6x12 DIN-7895H**.
- 10) Screw the 8 Phillips screws **M6x20 DIN-7895H**, which join the DC Bus and the Bus bridge.
- 11) Screw the 2 Phillips screws **M6x20 DIN-7895H**, which join the DC Bus and the Bus bridge
- 12) Insert the electronic tray by screwing the 4 Phillips screws **M4x8 DIN-7895H**.

Assembly of the DC Bus

- 1) Place the DC Bus in the chassis.
- 2) Screw the 2 Phillips screws **M4x8 DIN-7895H**, which join the DC Bus and the IGBTs heat exchanger.

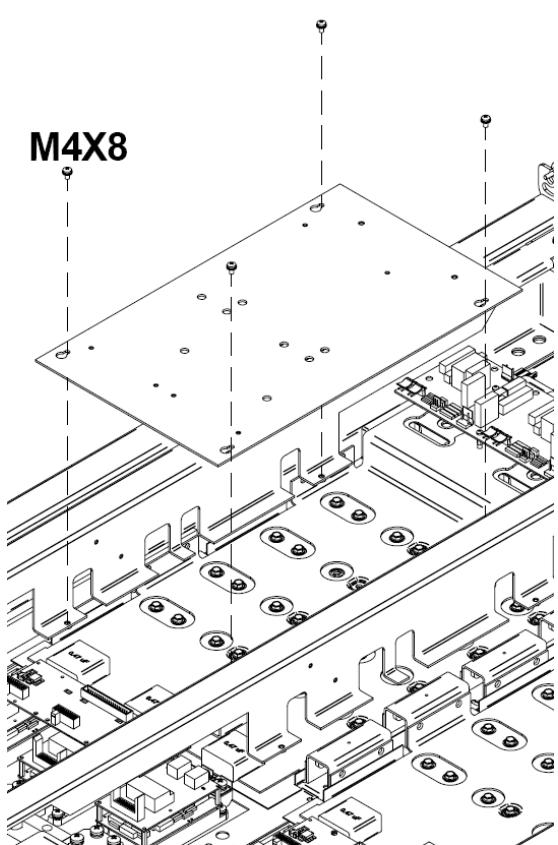


Figure 7.12 (a) Disassembly of the DC Bus.

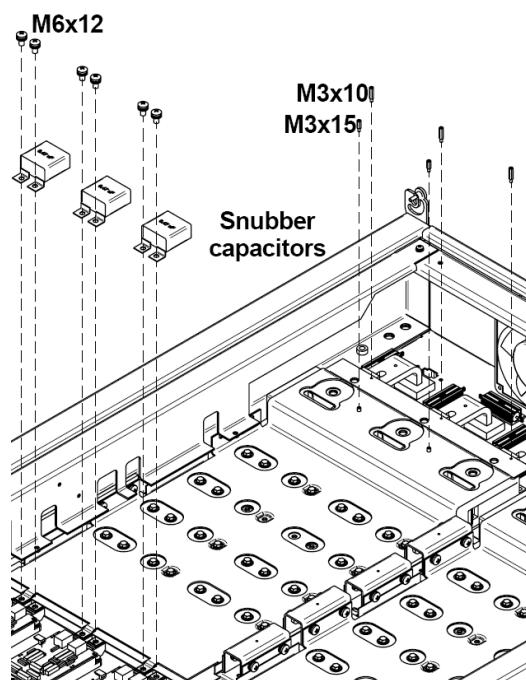


Figure 7.12. (b) Disassembly of the DC Bus.

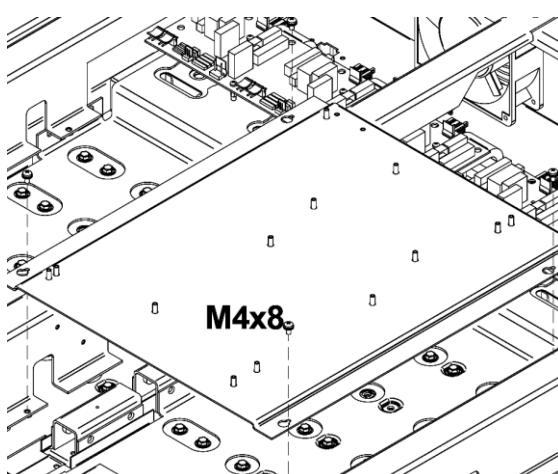


Figure 7.12 (b) Disassembly of the DC Bus.

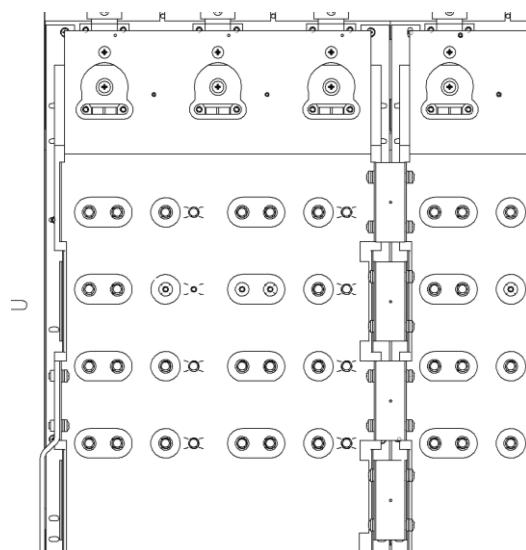


Figure 7.12. (c) Bus bridge.

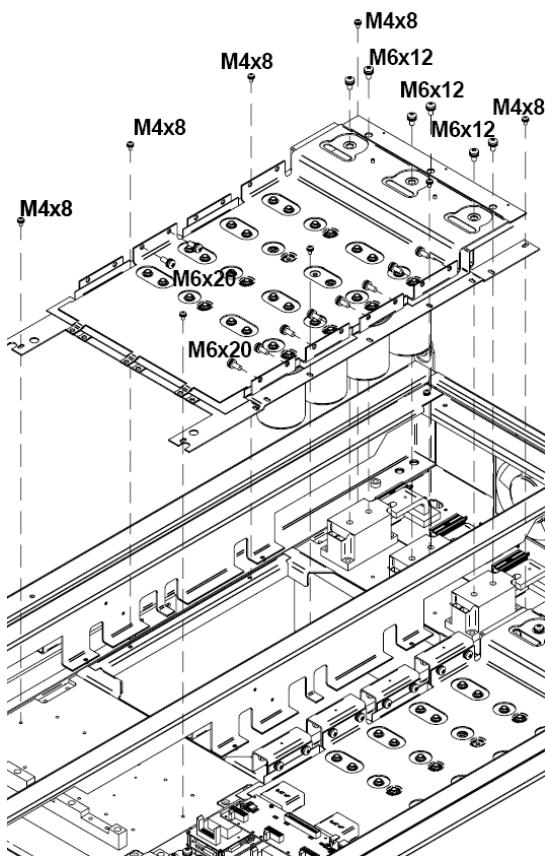


Figure 7.12. (d) Disassembly of the DC Bus.

7.9.11 BUS CAPACITORS

Before proceeding, the DC Bus must have been disassembled. (section 7.9.10).

Follow the *figure 7.13* while reading these instructions:

- 1) Unscrew the special hexagonal screws **M5x20**, which join the capacitor and the Bus(+).
- 2) Remove the Bus(+)
- 3) Remove the Bus(+) and the Bus(-) insulator.
- 4) Unscrew the special hexagonal screws **M5x20**, which join the capacitor and the Bus(-).
- 5) Remove the Bus (-).
- 6) Remove the Bus(-) and the middle Bus insulator.
- 7) Unscrew the special hexagonal screws **M5x20**, which join the middle Bus and the capacitors.
- 8) Remove the middle Bus.
- 9) Remove the capacitors of their rings.

Assembly of the Bus capacitors

- 1) Put the new capacitors on their rings
- 2) Insert the middle Bus (*figure 7.13*).
- 3) Screw the special hexagonal screws **M5x20**.
- 4) Insert the Bus(-) and the middle Bus insulator.
- 5) Insert the Bus (-) (*figure 7.13*).
- 6) Screw the special hexagonal screws **M5x20**, which join the Bus (-) and the capacitors.
- 7) Put the Bus (+) and the Bus (-) insulator.
- 8) Insert the Bus (+) (*figure 7.13*).
- 9) Screw the special hexagonal screws **M5x20**, which join the Bus (+) and the capacitors.

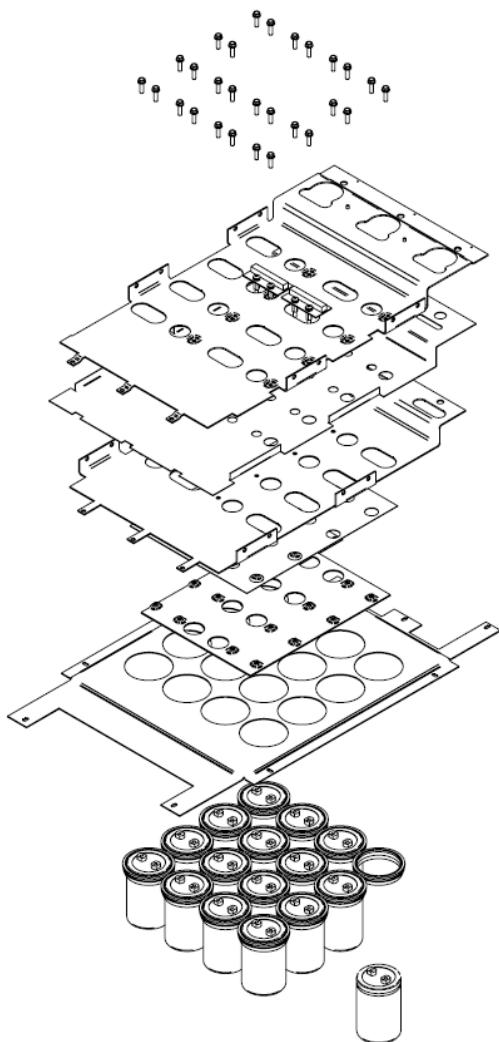


Figure 7.13. Disassembly of the Bus capacitors.

7.9.12 IGBTs CONNECTOR BOARD

Disassembly of the IGBTs connector board.

In the SD700 frame 8 there are 3 IGBTs connector boards, but in each board there are 4 upper Gate Drive connected.

The use of a static grounding wrist strap and being earthed is highly required.

Follow *figure 7.14* while reading these instructions:

- 1) Disconnect the IGBT trigger wire, which connects this board and the Power board.
- 2) Disconnect the 3 NTC wires, which connect this board and the Upper Gate Drive.
- 3) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join this board and the plastic hexagonal spacers **M4x40**, which are inserted in the IGBT heat exchanger.
- 4) Disassemble the IGBTs connector board.

Assembly of the IGBTs connector board.

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Put the new board on the plastic hexagonal spacers **M4x40**
- 3) Screw the 4 Phillips screws **M4x8 DIN-7895H**, which join this board and the plastic hexagonal spacers **M4x40**, which are inserted in IGBT's heat exchanger
- 4) Connect the IGBT trigger wire.
- 5) Connect the NTC wires

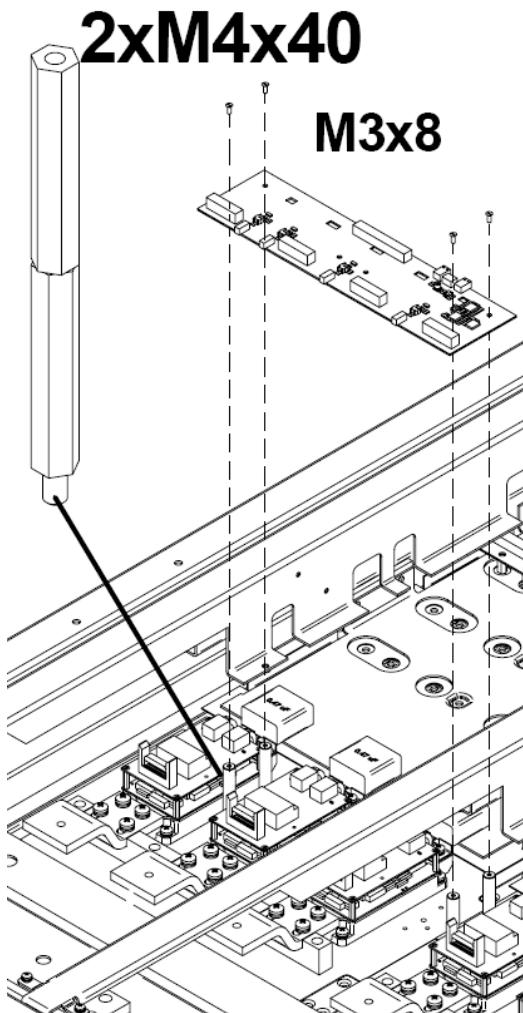


Figure 7.15. Disassembly of the IGBT's Connector Board

7.9.13 UPPER GATE DRIVE

Disassembly of the Upper Gate Drive

Before proceeding, the IGBTs connector board must have been disassembled. (section 7.9.12).

Follow *figure 7.15* while reading these instructions:

- 1) Disconnect the phone wires, which connect this board to the lower Gate Drive.
- 2) Unscrew the Phillips screws **M3x8** DIN-7895H, which join this board and the hexagonal spacers **M3x18**.
- 3) Disassemble the Upper Gate Drive.

Assembly of the upper Gate Drive

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Put the new board on the hexagonal spacers **M3x18**. (*figure 7.15*).
- 3) Screw 3 Phillips screws **M3x8** DIN-7895H, which join this board and the hexagonal spacers **M3x18**.
- 4) Connect the phone wires.

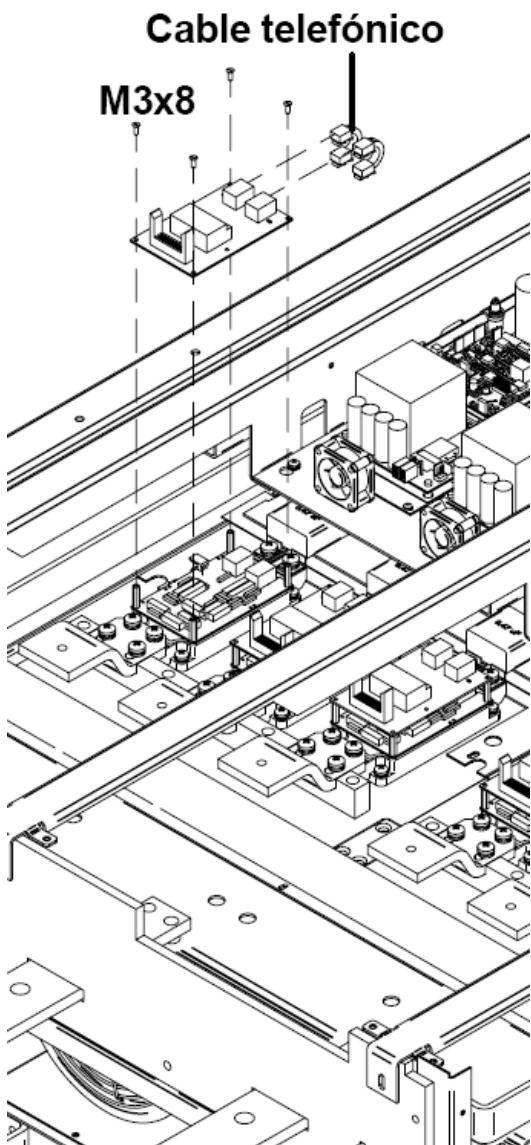


Figure 7.16. Disassembly of the Upper Gate drive

7.9.14. IGBT

Disassembly of the IGBT

Before proceeding, the upper Gate Drive board must have been disassembled. (section 7.9.14).

Follow *figure 7.17 (a)* and *figure 7.17 (b)* while reading these instructions:

- 1) Unscrew the 4 hexagonal spacers **M3x18**, where the upper Gate Drive is inserted.
- 2) Unscrew the 2 Phillips screws **M6x12 DIN-7895H**, which join the Snubber capacitors and the IGBTs.
- 3) Remove the DC Bus (section 7.9.10).
- 4) Remove the Snubber capacitors
- 5) Unscrew the 3 Phillips screws **M6x20 DIN-7895H**, which join the IGBT and the bar where the DCCTs are screwed.
- 6) Remove the bar where the DCCTs are screwed.
- 7) Unscrew the 4 Phillips screws **M5x16 DIN-7895H**, which join the IGBT and the heat exchanger.
- 8) Disassemble the IGBT.

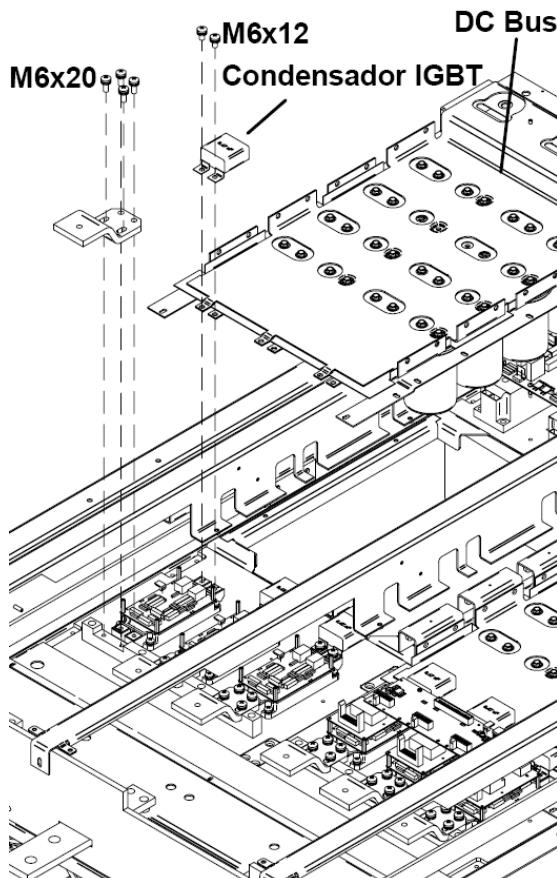


Figure 7.17(a). Disassembly of the IGBT

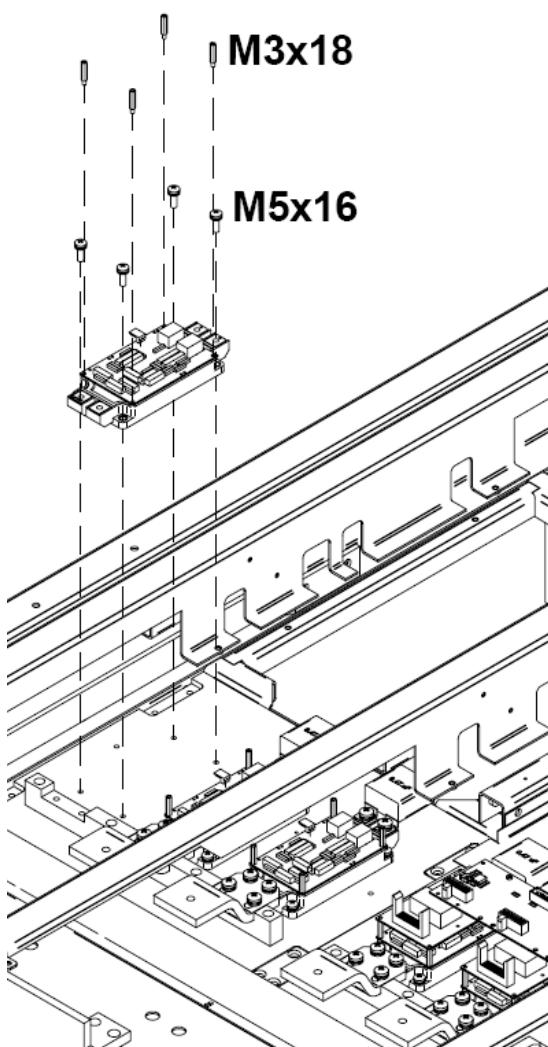


Figure 7.17.(b) Disassembly of the IGBT

Assembly of the IGBT

Continue to observe static safe work procedures.

- 1) Avoid an excessive handling of the new board.
- 2) Take out the new IGBT of the static box.
- 3) Spread the thermal paste over the back of the IGBT.
- 4) Put the IGBT on the heat exchanger.
- 5) Screw the 4 Phillips screws **M5x16** DIN-7895H, which join the IGBT and the heat exchanger.
- 6) Place the DCCT Bar as it is shown in *figure 7.16*.
- 7) Insert the DC Bus (*section 7.9.10*).
- 8) Place the Snubber capacitor on the DC Bus.

7.9.15 SCRs

Disassembly of the SCRs

Before proceeding, the Upper cover (*section 7.9.2*), Snubber Trigger and Soft charge board (*section 7.9.6*), and DC Bus (*section 7.9.10*) must have been disassembled.

Follow *figure 7.18* and *figure 7.19* while reading these instructions:

- 1) Unscrew the hexagonal screws **M8x25** DIN-933, which join the bars and the SCRs.
- 2) Remove the voltage measure wires after the AC choke by unscrewing the Phillips screws **M4x8** DIN-7895H, which join these wires and the bars.
- 3) Remove the bars.

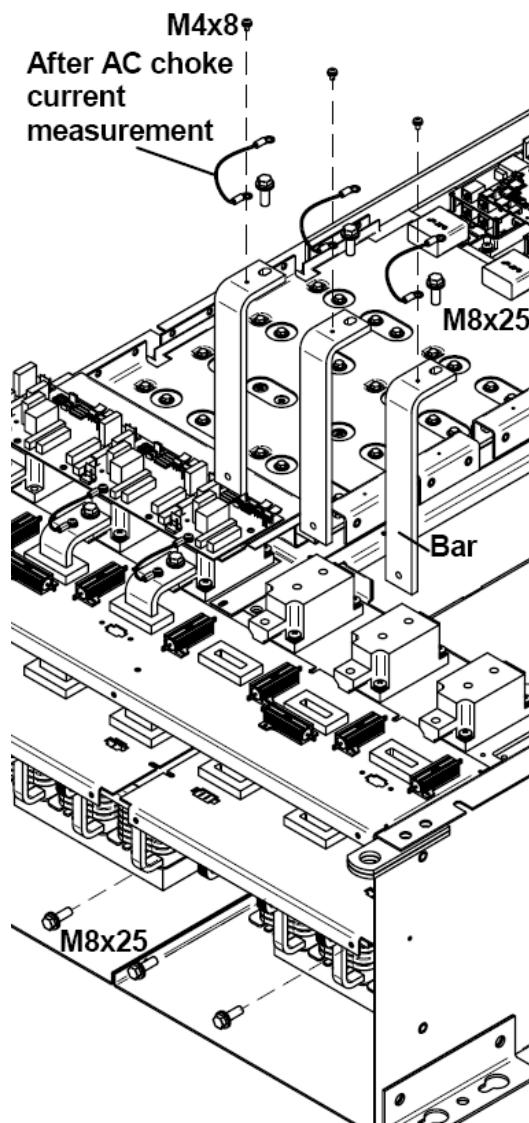


Figure 7.18. Disassembly of the bars

- 4) Unscrew the 2 Phillips screws **M5x12 DIN-7895H**, which join the SCR and the heat exchanger.
- 5) Remove the SCR.

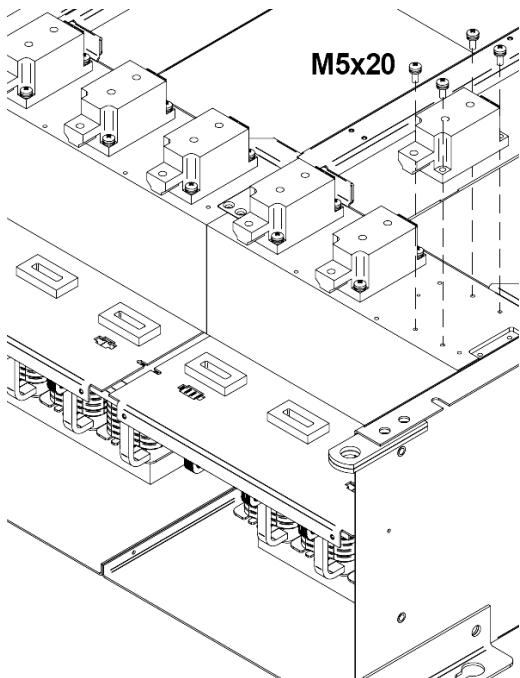


Figure 7.19. Disassembly of the SCR

Assembly of the SCRs

Spread the thermal paste over the back of the new SCR.

- 1) Insert the SCR in the heat exchanger (figure 7.16)
- 2) Screw 2 Phillips screws **M5x12 DIN-7895H**, which join the SCR and the heat exchanger.
- 3) Insert the bars (figure 7.16(a))
- 4) Insert the voltage measure wires after the AC Choke by imscreing the Phillips screws **M4x8 DIN-7895H**, which join their wires and the bars.
- 5) Screw the Phillips screws **M6x20 DIN-7895H**, which join the bars and the AC Choke.
- 6) Screw the Phillips screws **M6x16 DIN-7895H**, which join the bars and the SCRs.

7.9.16 POWER FAN

Disassembly of the Fan support

Follow *figure 7.20* while reading these instructions:

- 1) Unscrew the Phillips screw **M4x8 DIN-7895**, which joins the fan support and the fan box.
- 2) Unscrew the 2 Phillips screws **M4x8 DIN-7895H**, which join the fan support and the output choke support.
- 3) Disconenct the fan power wire.
- 4) Remove the fan support.

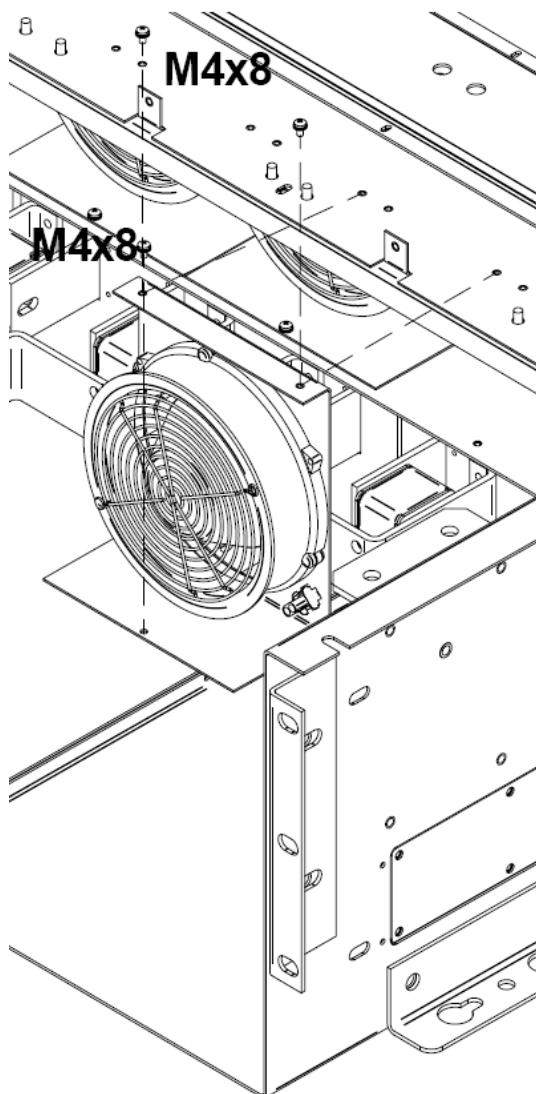


Figura 7.20. Disassembly of the fan support

24VDC, 2A, 48W, 172X172 FAN

Follow *figure 7.21* while reading these instructions:

Unscrew the 2 slotted cheese head screws **M4x60** DIN-84, which join the power fan and its support.

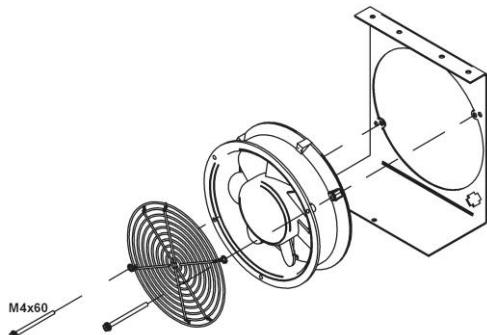


Figure 7.21 Disassembly of the fan

24VDC, 89W, 172X172 FAN

Follow *figure 7.22* while reading these instructions:

Unscrew the 2 Phillips screws **M4x12** DIN-7895H, which join the power fan and its support.

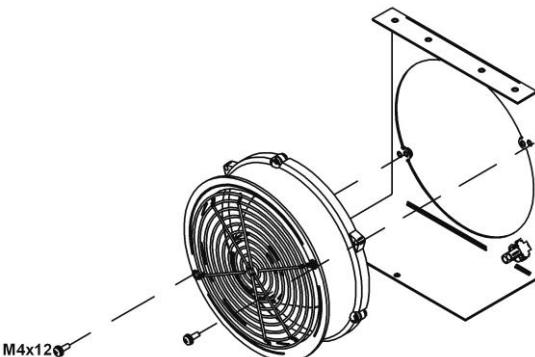


Figure 7.22 Disassembly of the fan

Assembly of the Fan power support

- 1) Before introducing the fan support in the fan box, connect the fan power wire.
- 2) Screw the 2 Phillips screws **M4x8** DIN-7895H, which join the fan support and the output choke support.
- 3) Screw the Phillips screw **M4x8** DIN-7895H, which join the fan support and the fan box.

7.9.17 AC CHOKE.**Disassembly of the AC Choke**

Before proceeding, the bars, which join the AC choke and the SCRs (section 7.9.15) and the Upper cover (section 7.9.2) must have been disassembled

Follow *figure 7.23* while reading these instructions:

- 1) Unscrew the 4 Phillips screws **M6x16** DIN-7895H, which join the AC choke and the chassis.
- 2) Remove the AC choke out of the chassis, and disconnect the 3 power wires by unscrewing the hexagonal screws **M8x25** DIN-961, which join the power wires and the AC choke.
- 3) Disassemble the AC choke.

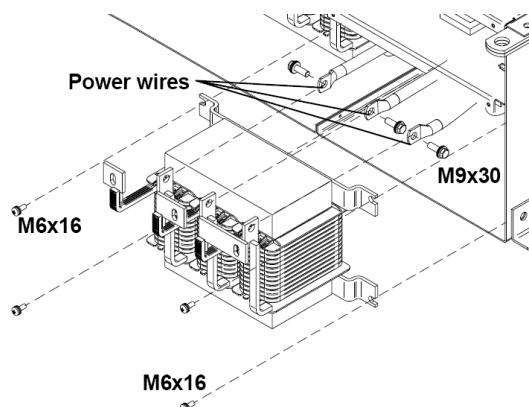


Figure 7.23 Disassembly of the AC choke

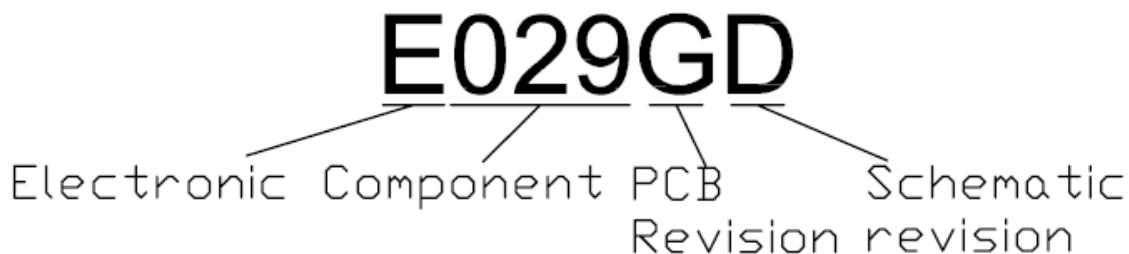
Assembly of the AC choke

- 1) Bring the AC choke near to the chassis and connect the power wires by screwing the hexagonal screws **M8x25** DIN-961.
- 2) Place the AC choke in the chassis and screw the 4 Phillips screws **M6x16** DIN-7895H, which join the AC choke and the chassis.

8. Parts list.

All SD700 components have a code, which give us all the information about the component. These codes have between 4 and 6 digits:

- 1^{rs} digit: kind of component
 - o C: Printed circuits
 - o L: Electrics
 - o E: Electronics
 - o M: Mechanics
 - o P: Power
 - o V: Others
- 2^{on}, 3rd, 4Th digit: number of the component
- 5Th digit: Revision of component.
- 6Th digit: Only in electronic components. It shows the schematic revision.



8.1. SD700 Frame 4

PCBs

	SD700 FRAME 380V			
IP54/IP20 models	SD700905X	SD701155X	SD701505X	SD701705X
Control PCB	E024HA	E024HA	E024HA	E024HA
Power PCB	E028GJ	E028GJ	E028GJ	E028GJ
Snubbers PCB	E072BB	E072BB	E072BB	E072BB
Lower Gate-Drive	E088BC	E088BC	E089BC	E089BC
Upper Gate-Drive	G003A	G003A	G003A	G003A
IGBTs connector PCB	E083AA	E083AA	E083AA	E083AA
IGBT selection module	E038BA	E038BA	E038BA	E038BA

	SD700 FRAME 4 690V			
IP54/IP20 models	SD700526X	SD700626X	SD700806X	SD701056X
Control PCB	E024HA	E024HA	E024HA	E024HA
Power PCB	E107BD	E107BD	E107BD	E107BD
Snubbers PCB	E114BC	E114BC	E114BC	E114BC
Lower Gate-Drive	E116BC		E117BC	E117BC
Upper Gate-Drive	G005A	G005A	G005A	G005A
IGBTs connector PCB	E083AA	E083AA	E083AA	E083AA
IGBT selection module	E038BA	E038BA	E038BA	E038BA

SCRs

SCR	380V	NUMBER
P101	SD700905X	3
P101	SD701155X	3
P101	SD701505X	3
P101	SD701705X	3

SCR	690V	NUMBER
P112	SD700526X	3
P115	SD700626X	3
P111	SD700806X	3
P111	SD701056X	3

IGBT

IGBT	380V	NUMBER
FF225R12ME3	SD700905X	3
FF225R12ME3	SD701155X	3
FF300R12ME3	SD701505X	3
FF300R12ME3	SD701705X	3

IGBT	690V	NUMBER
F225R17ME3	SD700526X	3
F225R17ME3	SD700626X	3
F225R17ME3	SD700806X	3
FF300R17ME3	SD701056X	3

BUS CAPACITORS

380V	I (A)	Capacitors
SD700905X	90	1*6
SD701155X	115	1*6
SD701505X	150	1*8
SD701705X	170	1*8

690V	I (A)	Capacitors
SD700526x	52	1*6
SD700626x	62	
SD700806x	80	1*9
SD701056x	105	1*9

DCCT

DCCT	380V	NUMBER
L116	SD700905X	3
L116	SD701155X	3
L090	SD701505X	3
L090	SD701705X	3

DCCT	690V	NUMBER
L201	SD700526X	3
	SD700626X	3
L116	SD700806X	3
L116	SD701056X	3

OUTPUT CHOKE

Models	Output choke	Turns	Wire section
SD700905x	3	5	25
SD701155x	3	5	25
SD701505x	3	4	35
SD701705x	3	3	35

Models	Output choke	Turns	Wire section
SD700526x	3	7	16
SD700626x	3	7	16
SD700806x	3	6	25
SD701056x	3	5	25

FANS

REFERENCE	DESCRIPTION	380V			
		SD7009052	SD7009055	SD7011552	SD7011555
L163	8414NH 24VDC, 2.4W		2		2
L050	8314H 24VDC, 6W	4		4	
L086	6224NTDA 24VDC, 2A, 48W	1		1	

L119	DV6224TD 24VDC, 89W				
L120	4314-180 24VDC, 9.5W				
L202	8314HU, IP54, 6W		2		2
L162	6224NTDAU, IP54, 24VDC,48W		1		1
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4,5W				

REFERENCE	DESCRIPTION	380V			
		SD7015052	SD7015055	SD7017052	SD7017055
L163	8414NH 24VDC, 2.4W		2		2
L050	8314H 24VDC, 6W	4		4	
L086	6224NTDA 24VDC, 2A, 48W	1			
L119	DV6224TD 24VDC, 89W			1	
L120	4314-180 24VDC, 9.5W				
L202	8314HU, IP54, 6W 80X80		2		2
L162	6224NTDAU, IP54, 24VDC,48W		1		
L160	DV6224TDU-845, IP54, 24VDC, 89W				1
L192	4114NXU, IP54, 24VDC, 4,5W				

REFERENCE	DESCRIPTION	690V			
		SD7005262	SD7005265	SD7006262	SD7006265
L163	8414NH 24VDC, 2.4W		2		2
L050	8314H 24VDC, 6W	4		4	
L086	6224NTDA 24VDC, 2A, 48W	1		1	
L119	DV6224TD 24VDC, 89W				
L120	4314-180 24VDC, 9.5W				
L202	8314HU, IP54, 6W 80X80		2		2
L162	6224NTDAU, IP54, 24VDC,48W		1		1
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4,5W				

REFERENCE	DESCRIPTION	690V			
		SD7008062	SD7008065	SD7010562	SD7010565
L163	8414NH 24VDC, 2.4W		2		2
L050	8314H 24VDC, 6W	4		4	
L086	6224NTDA 24VDC, 2A, 48W	1			
L119	DV6224TD 24VDC, 89W			1	
L120	4314-180 24VDC, 9.5W				
L202	8314HU, IP54, 6W 80X80		2		2
L162	6224NTDAU, IP54, 24VDC,48W		1		1
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4,5W				

8..2. SD700 Frame 5

PCBs

	SD700 FRAME 5 380V	
IP54/IP20 models	SD702105X	SD702505X
Control PCB	E024HA	E024HA
Power PCB	E028GJ	E028GJ
Snubbers PCB	E068BB	E068BB
Lower Gate-Drive	E078BD	E078BD
Upper Gate-Drive	G003A	G003A
IGBTs connector PCB	E083AA	E083AA
IGBT selection module	E038BA	E038BA

	SD700 FRAME 5 690V		
IP54/IP20 models	SD701306X	SD701506X	SD701706X
Control PCB	E024HA	E024HA	E024HA
Power PCB	E107BD	E107BD	E107BD
Snubbers PCB	E113BB	E113BB	E113BB
Lower Gate-Drive	E117BC	E115BC	E115BC
Upper Gate-Drive	G005A	G005A	G005A
IGBTs connector PCB	E083AA	E083AA	E083AA
IGBT selection module	E038BA	E038BA	E038BA

SCRs

SCR	380V	NUMBER
P067	SD702105X	3
P067	SD702505X	3

SCR	690V	NUMBER
P111	SD701306X	3
P111	SD701506X	3
P114	SD701706X	3

IGBT

IGBT	380V	NUMBER
FF450R12ME3	SD702105X	3
FF450R12ME3	SD702505X	3

IGBT	690V	NUMBER
FF300R17ME3	SD701306X	3
FF450R17ME3	SD701506X	3
FF450R17ME3	SD701706X	3

BUS CAPACITORS

380V	I (A)	Capacitors
SD702105X	210	1*16
SD702505X	250	1*16

690V	I (A)	Capacitors
SD701306x	130	1*12
SD701506x	150	1*15
SD701706x	170	1*15

DCCT

DCCT	380V	NUMBER
L090	SD702105X	3
L090	SD702505X	3

DCCT	690V	NUMBER
L116	SD701306X	3
L116	SD701506X	3
L090	SD701706X	3

OUTPUT CHOKE

Models	Output choke	Turns	Wire section
SD702105x	3	4	70
SD702505x	3	4	70

Models	Output choke	Turns	Wire section
SD701306x	3	7	35
SD701506x	3	6	50
SD701706x	3	6	50

FANS

REFERENCE	DESCRIPTION	380 V			
		SD7021052	SD7021055	SD7025052	SD7025055
L163	8414NH 24VDC, 2.4W				
L050	8314H 24VDC, 6W				
L086	6224NTDA 24VDC, 2A, 48W	2		2	
L119	DV6224TD 24VDC, 89W				
L120	4314-180 24VDC, 9.5W	4		4	
L202	8314HU, IP54, 6W 80X80				
L162	6224NTDAU, IP54, 24VDC,48W		2		2
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4,5W		4		4

REFERENCE	DESCRIPTION	690 V					
		SD7013062	SD7013065	SD7015062	SD7015065	SD7017062	SD7017065
L163	8414NH 24VDC, 2.4W						
L050	8314H 24VDC, 6W						
L086	6224NTDA 24VDC, 2A, 48W	2		2		2	
L119	DV6224TD 24VDC, 89W						
L120	4314-180 24VDC, 9.5W	4		4		4	
L202	8314HU, IP54, 6W						
L162	6224NTDAU, IP54, 24VDC,48W		2		2		2
L160	DV6224TDU-845, IP54, 24VDC, 89W						
L192	4114NXU, IP54, 24VDC, 4,5W		4		4		4

8.3. SD700 Frame 6

PCBs

	SD700 FRAME 6 380V		
IP54/IP20 models	SD703305X	SD703705X	SD704605X
Control PCB	E024HA	E024HA	E024HA
Power PCB	E028GJ	E028GJ	E028GJ
Snubbers PCB	E068BB	E068BB	E068BB
Lower Gate-Drive	E089BC	E089BC	E078BD
Upper Gate-Drive	G003A	G003A	G003A
IGBTs connector PCB	E087AB	E087AB	E087AB
IGBT selection module	E039BA	E039BA	E039BA

	SD700 FRAME 6 690V		
IP54/IP20 models	SD702106X	SD702606X	SD703206X
Control PCB	E024HA	E024HA	E024HA
Power PCB	E107BD	E107BD	E107BD
Snubbers PCB	E113BB	E113BB	G005A
Lower Gate-Drive	E117BC	E117BC	E115BC
Upper Gate-Drive	G005A	G005A	G005A
IGBTs connector PCB	E087AB	E087AB	E087AB
IGBT selection module	E039BA	E039BA	E039BA

SCRs

SCR	380V	NUMBER
P067	SD703305X	6
P067	SD703705X	6
P067	SD704605X	6

SCR	690V	NUMBER
P114	SD702106X	6
P114	SD702606X	6
P114	SD703206X	6

IGBT

IGBT	380V	NUMBER
FF300R12ME3	SD703305X	6
FF300R12ME3	SD703705X	6
FF450R12ME3	SD704605X	6

IGBT	690V	NUMBER
FF450R17ME3	SD702106X	6
FF300R17ME3	SD702606X	6
FF450R17ME3	SD703206X	6

BUS CAPACITORS

380V	I (A)	Capacitors
SD703305X	330	2*12 (24)
SD703705X	370	2*12(24)
SD704605X	460	2*16(32)

690V	I (A)	Capacitors
SD702106X	210	2*9(18)
SD702606X	260	2*12(24)
SD703206X	320	2*15(30)

DCCT

DCCT	380V	NUMBER
L091	SD703705X	3
L092	SD704605X	3
L092	SD705805X	3

DCCT	690V	NUMBER
L091	SD702106X	3
L091	SD702606X	3
L091	SD703206X	3

OUTPUT CHOKE

Models	Output choke	Turns	Wire section
SD703305x	6	4	70
SD703705x	6	4	70
SD704605x	6	4	70

Models	Output choke	Turns	Wire section
SD702106x	6	9	35
SD702606x	6	7	35
SD703206x	6	9	35

FANS

REFERENCE	DESCRIPTION	380 V					
		SD7033052	SD7033055	SD7037052	SD7037055	SD7046052	SD7046055
L163	8414NH 24VDC, 2.4W		1		1		1
L050	8314H 24VDC, 6W						
L086	6224NTDA 24VDC, 2A, 48W	4		4		4	
L119	DV6224TD 24VDC, 89W						
L120	4314-180 24VDC, 9.5W	8		8		8	
L202	8314HU, IP54, 6W						
L162	6224NTDAU, IP54, 24VDC,48W		4		4		4
L160	DV6224TDU-845, IP54, 24VDC, 89W						
L192	4114NXU, IP54, 24VDC, 4,5W		7		7		7

REFERENCE	DESCRIPTION	690 V					
		SD7021062	SD7021065	SD7026062	SD7026065	SD7032062	SD7032065
L163	8414NH 24VDC, 2.4W		1		1		1
L050	8314H 24VDC, 6W						
L086	6224NTDA 24VDC, 2A, 48W	4		4		4	
L119	DV6224TD 24VDC, 89W						
L120	4314-180 24VDC, 9.5W	8		8		8	
L202	8314HU, IP54, 6W 80X80						
L162	6224NTDAU, IP54, 24VDC,48W		4		4		4
L160	DV6224TDU-845, IP54, 24VDC, 89W						
L192	4114NXU, IP54, 24VDC, 4,5W		7		7		7

8.4. SD700 Frame 7

PCBs

SD700 FRAME 7 380V			
IP54/IP20 models	SD705805X	SD706505X	SD707205X
Control PCB	E024HA	E024HA	E024HA
Power PCB	E028GJ	E028GJ	E107BD
Snubbers PCB	E068BB	E068BB	E113BB
Lower Gate-Drive	E089BC	E078BD	E117BC
Upper Gate-Drive	G003A	G003A	G005A
IGBTs connector PCB	E087AB	E087AB	E087AB
IGBT selection module	E040BA	E040BA	E039BA

SD700 FRAME 7 690V		
IP54/IP20 models	SD703856X	SD704606X
Control PCB	E024HA	E024HA
Power PCB	E107BD	E107BD
Snubbers PCB	E113BB	E113BB
Lower Gate-Drive	E115BC	E115BC
Upper Gate-Drive	G005A	G005A
IGBTs connector PCB	E087AB	E087AB
IGBT selection module	E040BA	E040BA

SCRs

SCR	380V	NUMBER
P067	SD705805X	9
P067	SD706505X	9
P114	SD707205X	9

SCR	690V	NUMBER
P114	SD703856X	9
P114	SD704606X	9

IGBT

IGBT	380V	NUMBER
FF300R12ME3	SD705805X	9
FF450R12ME3	SD706505X	9
FF450R12ME3	SD707205X	9

IGBT	690V	NUMBER
FF300R17ME3	SD703856X	9
FF450R17ME3	SD704606X	9

BUS CAPACITORS

380V	I (A)	Capacitors
SD705805X	580	3*12(36)
SD706505X	650	3*16(48)
SD707205X	720	3*16(48)

690V	I (A)	Capacitors
SD703856x	385	3*12(36)
SD704606x	460	3*15(45)

DCCT

DCCT	380V	NUMBER
L092	SD705805X	3
L123	SD706505X	3
L091	SD707205X	3

DCCT	690V	NUMBER
L091	SD703856X	3
L092	SD704606X	3

OUTPUT CHOKE

Models	Output choke	Turns	Wire section
SD705805x	9	4	70
SD706505x	9	4	70
SD707205x	9	4	70

Models	Output choke	Turns	Wire section
SD703856x	9	7	35
SD704606x	9	6	50

FANS

REFERENCE	DESCRIPTION	380V					
		SD7058052	SD7058055	SD7065052	SD7065055	SD7072052	SD7072055
L163	8414NH 24VDC, 2.4W		1		1		1
L050	8314H 24VDC, 6W						
L086	6224NTDA 24VDC, 2A, 48W	6		6		6	
L119	DV6224TD 24VDC, 89W						
L120	4314-180 24VDC, 9.5W	12		12		12	
L202	8314HU, IP54, 6W						
L162	6224NTDAU, IP54, 24VDC,48W		6		6		6
L160	DV6224TDU-845, IP54, 24VDC, 89W						
L192	4114NXU, IP54, 24VDC, 4,5W		11		11		11

REFERENCE	DESCRIPTION	690V			
		SD7038562	SD7038565	SD7046062	SD7046065
L163	8414NH 24VDC, 2.4W		1		1
L050	8314H 24VDC, 6W				
L086	6224NTDA 24VDC, 2A, 48W	6		6	
L119	DV6224TD 24VDC, 89W				
L120	4314-180 24VDC, 9.5W	12		12	
L202	8314HU, IP54, 6W 80X80				
L162	6224NTDAU, IP54, 24VDC,48W		6		6
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4,5W		11		11

8.5. SD700 Frame 8

PCBs

		SD700 FRAME 8 380V	
IP54/IP20 models		SD708405X	SD709255X
Control PCB		E024HA	E024HA
Power PCB		E028GJ	E028GJ
Snubbers PCB		E068BB	E068BB
Lower Gate-Drive		E078BD	E078BD
Upper Gate-Drive		G003A	G003A
IGBTs connector PCB		E132AA	E132AA
IGBT selection module		E040BA	E040BA

		SD700 FRAME 8 690V	
IP54/IP20 models		SD705506X	SD706606X
Control PCB		E024HA	E024HA
Power PCB		E107BD	E107BD
Snubbers PCB		E113BB	E113BB
Lower Gate-Drive		E115BC	E115BC
Upper Gate-Drive		G005A	G005A
IGBTs connector PCB		E132AA	E132AA
IGBT selection module		E040BA	E040BA

SCRs

SCR	380V	NUMBER
P067	SD708405X	12
P067	SD709255X	12

SCR	690V	NUMBER
P114	SD705506X	12
P114	SD706606X	12

IGBT

IGBT	380V	NUMBER
FF450R12ME3	SD708405X	12
FF450R12ME3	SD709255X	12

IGBT	690V	NUMBER
FF450R17ME3	SD705506X	12
FF450R17ME3	SD706606X	12

BUS CAPACITORS

380V	I (A)	Capacitors
SD708405X	840	4*16(64)
SD709255X	925	4*16(64)

690V	I (A)	Capacitors
SD705506x	550	4*15(60)
SD706606x	660	4*15(60)

FANS

REFERENCE	DESCRIPTION	380 V			
		SD7084052	SD7084055	SD7092552	SD7092555
L163	8414NH 24VDC, 2.4W		1		1
L050	8314H 24VDC, 6W				
L086	6224NTDA 24VDC, 2A, 48W	8		8	
L119	DV6224TD 24VDC, 89W				
L120	4314-180 24VDC, 9.5W	16		16	
L202	8314HU, IP54, 6W				
L162	6224NTDAU, IP54, 24VDC,48W		8		8
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4.5W		15		15

REFERENCE	DESCRIPTION	690V			
		SD7055062	SD7055065	SD7066062	SD7066065
L163	8414NH 24VDC, 2.4W		1		1
L050	8314H 24VDC, 6W				
L086	6224NTDA 24VDC, 2A, 48W	8		8	
L119	DV6224TD 24VDC, 89W				
L120	4314-180 24VDC, 9.5W	16		16	
L202	8314HU, IP54, 6W 80X80				
L162	6224NTDAU, IP54, 24VDC,48W		8		8
L160	DV6224TDU-845, IP54, 24VDC, 89W				
L192	4114NXU, IP54, 24VDC, 4.5W		15		15

DCCT

DCCT	380V	NUMBER
L154	SD708405X	3
L154	SD709255X	3

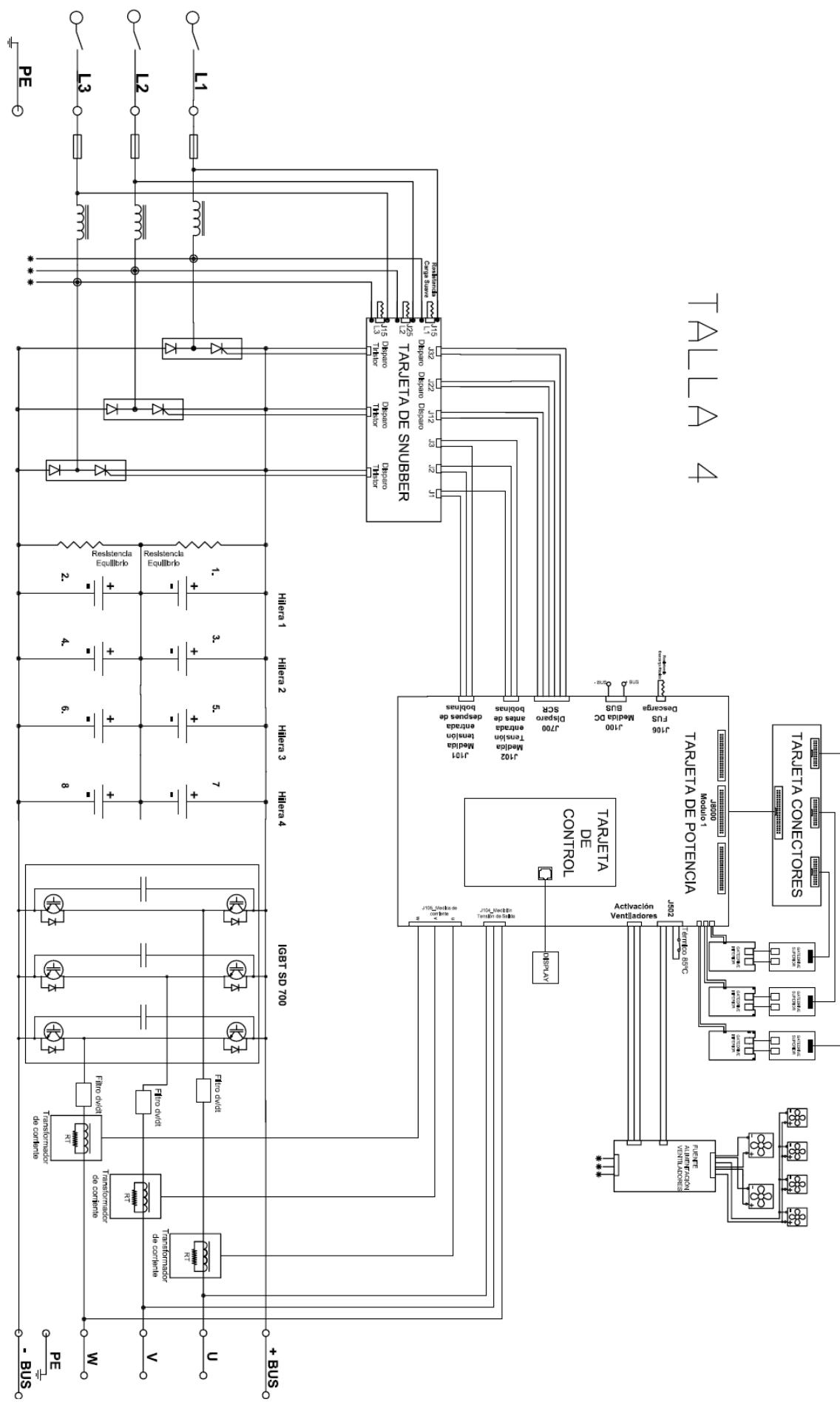
DCCT	690V	NUMBER
L152	SD705506X	3
L152	SD706606X	3

OUTPUT CHOKE

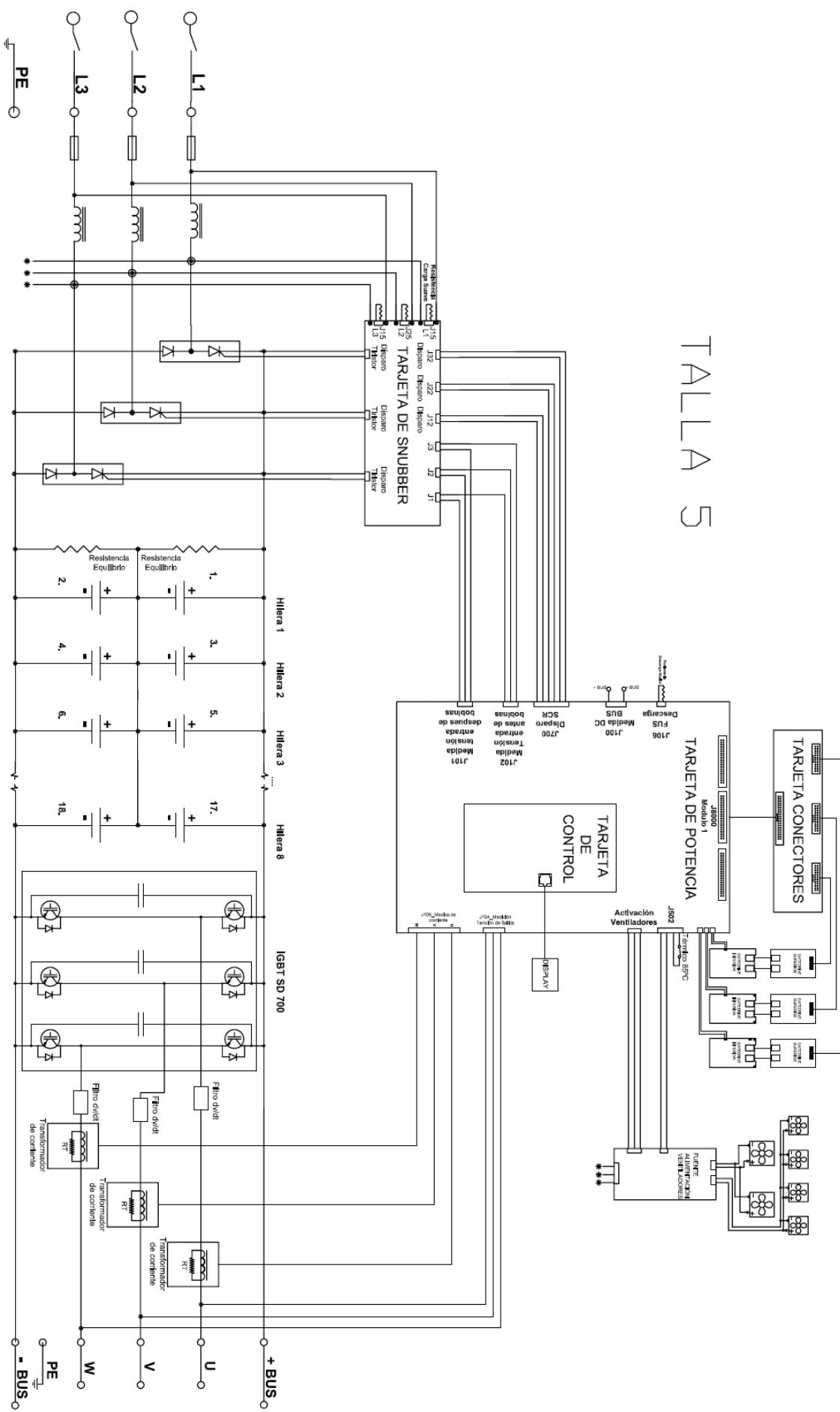
Models	Output choke	Turns	Wire section
SD708405x	12	4	70
SD709255x	12	4	70

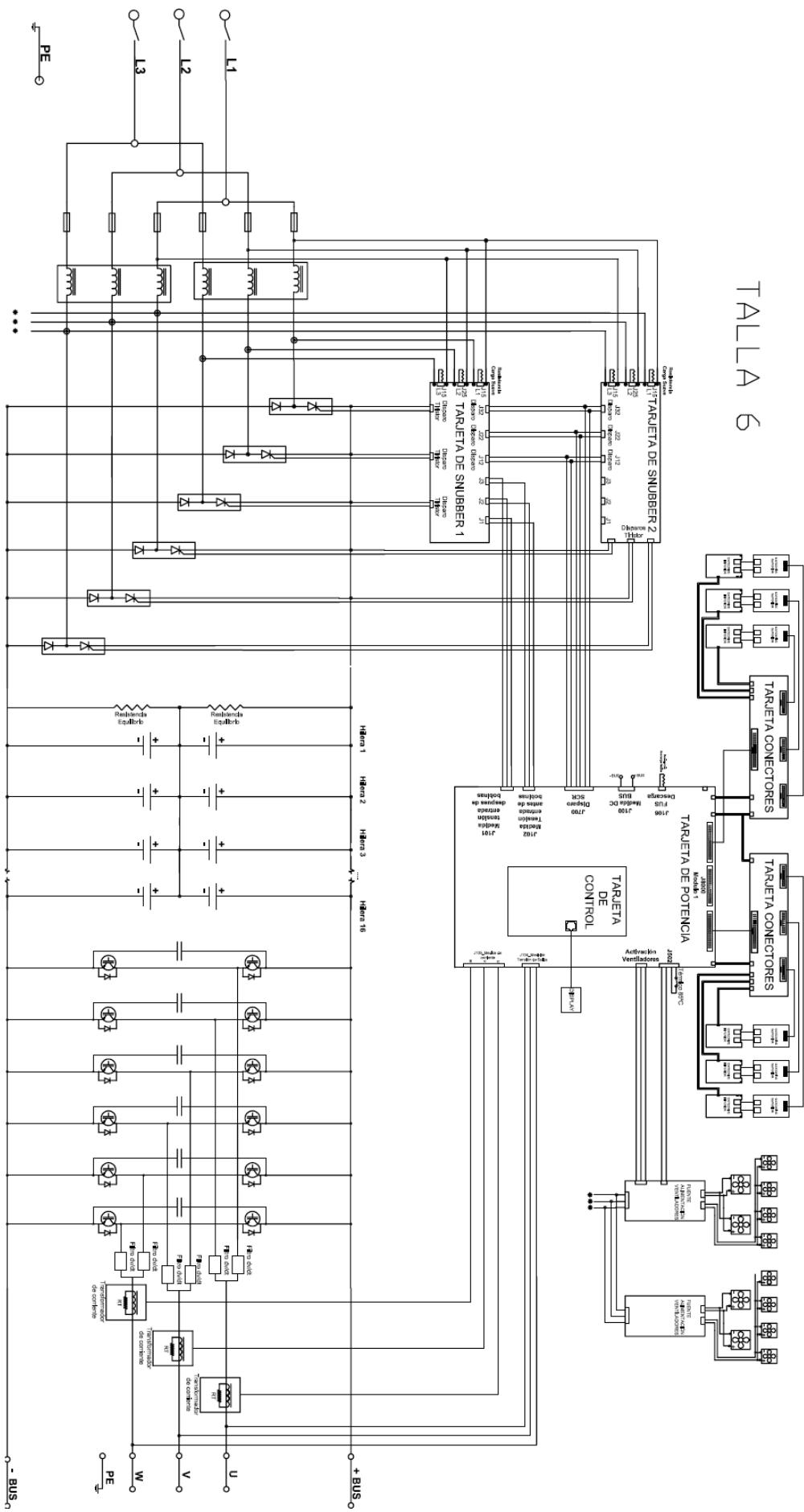
Models	Output choke	Turns	Wire section
SD705506x	12	6	50
SD706606x	12	6	50

BLOCK DIAGRAM



TALLA 5





TALLA 7

